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TAPPING AMERICA'S UNCONVENTIONAL OIL RESOURCES FOR JOB CREATION AND AFFORDABLE DOMESTIC ENERGY: TECHNOLOGY AND POLICY PATHWAYS

HEARING

BEFORE THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

ONE HUNDRED TWELFTH CONGRESS

SECOND SESSION

WEDNESDAY, APRIL 17, 2012

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TAPPING AMERICA'S UNCONVENTIONAL OIL RESOURCES FOR JOB CREATION AND AFFORDABLE DOMESTIC ENERGY: TECHNOLOGY AND POLICY PATHWAYS

TUESDAY, APRIL 17, 2012

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Committee met, pursuant to call, at 10:17 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Ralph Hall [Chairman of the Committee] presiding.

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Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology and Policy Pathways

Tuesday, April 17, 2012
10:00 a.m. -12:00 p.m.
2318 Rayburn House Office Building

Witnesses

Mr. Andrew Slaughter, Chair – Resource & Supply Task Group, National Petroleum Council Report "*Prudent Development*"

Ms. Karen Harbert, President and Chief Executive Officer, Institute for 21st Century Energy, U.S. Chamber of Commerce

Dr. Michelle Michot Foss, Chief Energy Economist, Center for Energy Economics, Bureau of Economic Geology, University of Texas-Austin

Mr. James Brown, President and Chief Operating Officer, Whiting Petroleum Corporation

Mr. Daniel Weiss, Senior Fellow and Director of Climate Strategy, Center for American Progress Action Fund.

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

HEARING CHARTER

Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology and Policy Pathways

Tuesday, April 17, 2012
10:00 a.m. -12:00 p.m.
2318 Rayburn House Office Building

PURPOSE

On Tuesday, April 17, 2012, the Committee on Science, Space, and Technology will hold a hearing entitled, "*Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology and Policy Pathways.*" The purpose of this hearing is to examine unconventional oil resources and identify technology and policy pathways to develop domestic energy resources.

WITNESS LIST

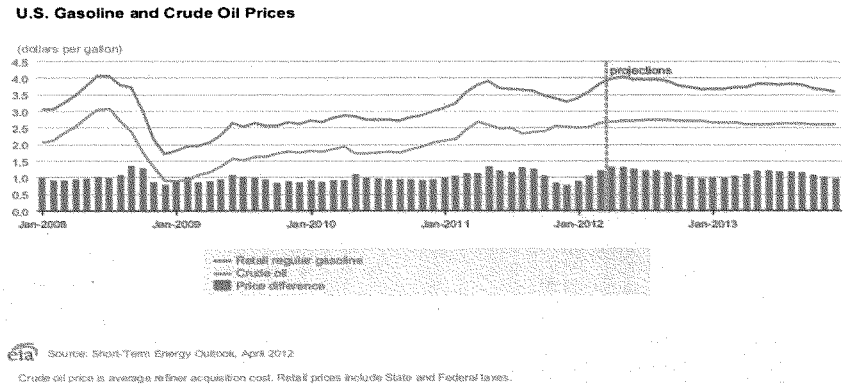
- **Mr. Andrew Slaughter,** Chair – Resource & Supply Task Group, National Petroleum Council Report "*Prudent Development;*"
- **Ms. Karen Harbert,** President and Chief Executive Officer, Institute for 21st Century Energy, U.S. Chamber of Commerce;
- **Dr. Michelle Michot Foss,** Chief Energy Economist, Center for Energy Economics, Bureau of Economic Geology, University of Texas-Austin;
- **Mr. James Brown,** President and Chief Operating Officer, Whiting Petroleum Corporation;
- **Mr. Daniel Weiss,** Senior Fellow and Director of Climate Strategy, Center for American Progress Action Fund.

BACKGROUND

Gasoline Prices

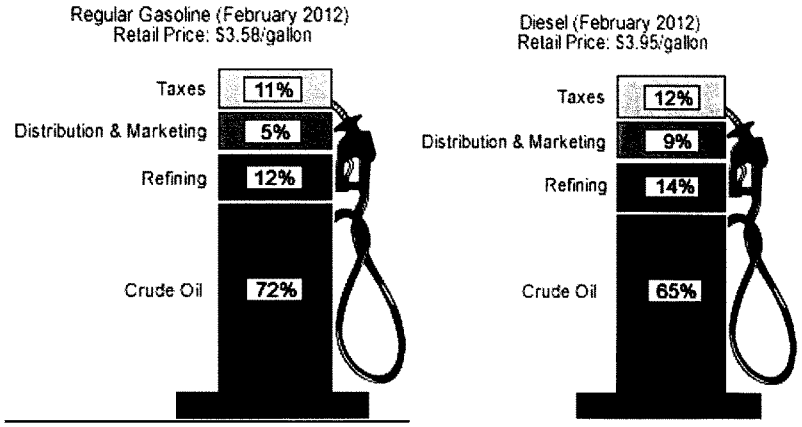
The national average price of a gallon of regular gasoline is currently $3.91,[1] an increase of about 60 cents per gallon since the beginning of the year. The Department of Energy's Energy Information Administration (EIA) estimates prices will remain close to four dollars per gallon throughout the summer of 2012 (Figure 1). The primary factor driving gasoline prices is the price of crude oil, representing 72 percent of the total cost of a gallon of gas (Figure 2). However, taxes, refining costs, and distribution and marketing also contribute to the price of a gallon of gasoline.

Figure 1. U.S. Gasoline and Crude Oil Prices.



[1] As of Thursday April 12, 2012. http://fuelgaugereport.aaa.com/

Figure 2. What we pay for in a gallon of gas.[2]



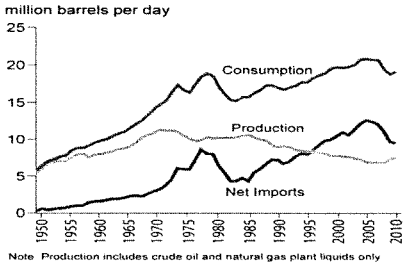
Crude Oil Market Conditions

Demand

Crude oil is a commodity traded in a global market, thus the price of a barrel of oil is set by a number of factors; namely global supply and demand conditions, geopolitical factors, and additional costs imposed by supply chain and infrastructure factors.

The United States currently consumes approximately 19 million barrels of petroleum per day (MMbd) (Figure 3), with global daily oil consumption at 89.1 MMbd. Global oil consumption is expected to increase about one percent, or 800,000 bpd, in 2012.[3] The United States demand for crude oil has been decreasing over the previous decade and over the next two decades domestic demand for

Figure 3. Petroleum Consumption, Production, and Import Trends.



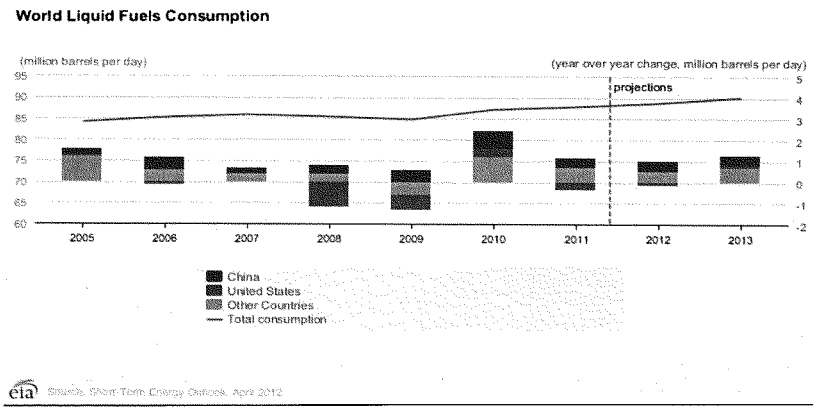
Source: U.S. Energy Information Administration, *Monthly Energy Review* (May 2011), preliminary data, and *Annual Energy Review 2009*, Table 5.1 (August 2010).

[2] U.S. Energy Information Administration, "Gasoline and Diesel Fuel Update," April 9, 2012. Accessible at: http://www.eia.gov/petroleum/gasdiesel/

[3] International Energy Agency, "*Oil Market Report*," March 14, 2012. Accessible at: http://omrpublic.iea.org/currentissues/full.pdf

crude oil is expected to decline by 1 percent per year;[4] however, global demand is projected to increase, primarily driven by economic growth from non-OECD countries (Figure 4).

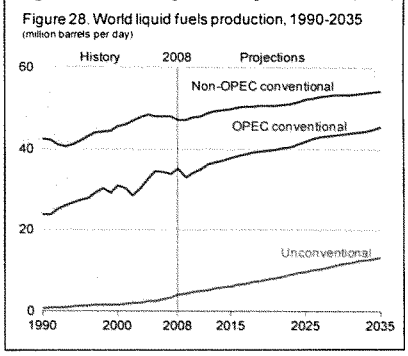
Figure 4: World Liquid Fuels Consumption[5]



Supply and Production

The United States currently produces 9.7 MMbd of refined petroleum per day (Figure 6). Global supply currently is 90 MMbd[6] (Figure 5) and is projected to grow to 112 MMbd by 2035.[7] The majority of current proven oil reserves are held by national oil companies, (Figure 7) though shifting resource outlooks are fundamentally altering resource ownership.

Figure 5: World liquid fuels production (EIA)



[4] National Petroleum Council, Working Document of the NPC North American Resource Development Study, "*Paper #1-6: Unconventional Oil,*" September 15, 2011, p. 14. Accessible at: http://www.npc.org/Prudent_Development-Topic_Papers/1-6_Unconventional_Oil_Paper.pdf

[5] Energy Information Administration, "Short-Term Energy and Summer Fuels Outlook," April 10, 2012. Accessible at: http://www.eia.gov/forecasts/steo/report/global_oil.cfm

[6] U.S. Energy Information Administration, "The Availability and Price of Petroleum and Petroleum Products Produced in Countries Other Than Iran," February 29, 2012. Accessible at: http://www.eia.gov/analysis/requests/ndaa/pdf/ndaa.pdf

[7] U.S. Energy Information Administration, "International Energy Outlook 2011," September 2011. Accessible at: http://www.eia.gov/forecasts/ieo/pdf/0484%282011%29.pdf

Figure 6: U.S. Crude Oil and Liquid Fuels Production[8]

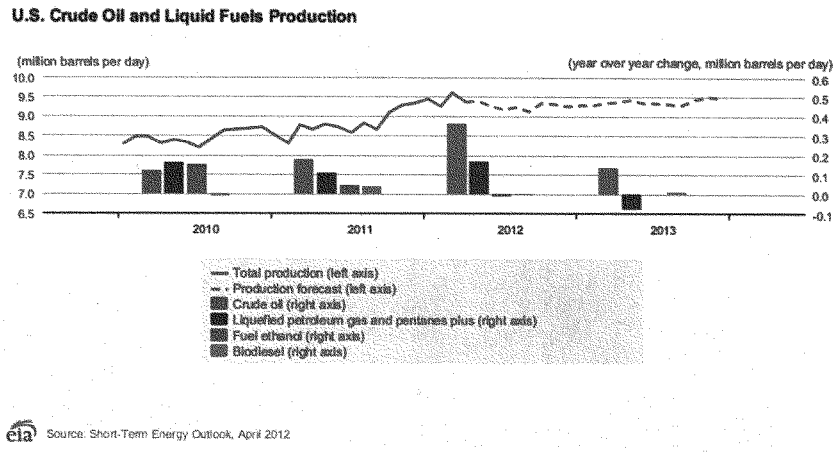
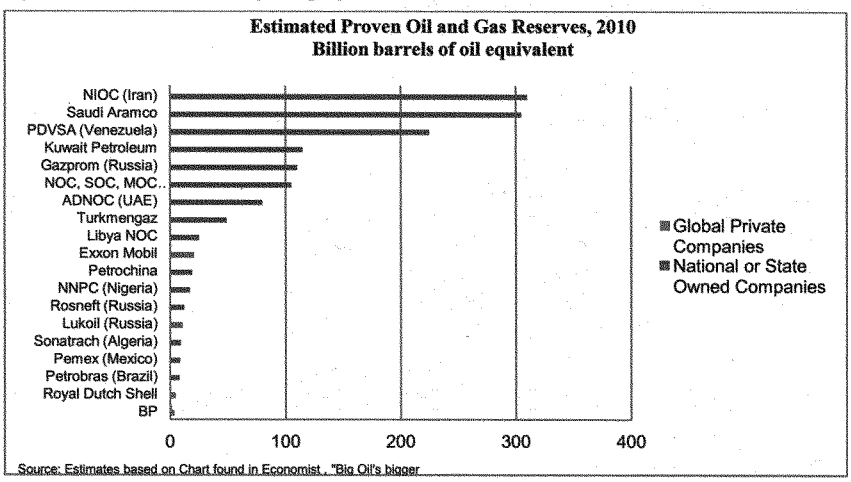


Figure 7: Proven Oil Reserves by Company[9]

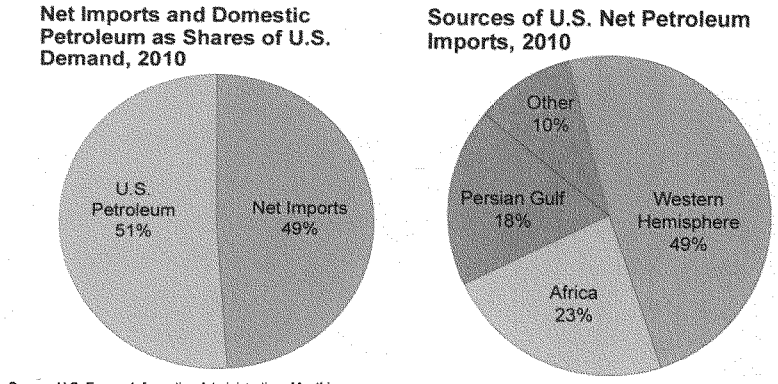


[8]U.S. EIA "Short-Term Energy and Summer Fuels Outlook."
[9] Adapted from data provide in *The Economist*, "Big Oil's bigger brothers," October 29, 2011. Accessible at: http://www.economist.com/node/21534794

Petroleum Imports

In 2010, the U.S. was a net petroleum importer of 9.4 MMbd, representing just under half of total U.S. demand (Figure 8). Approximately half of U.S. crude oil and petroleum imports are from the Western Hemisphere, with Canada as the top trading partner, providing 25 percent of U.S. imports. Due largely to the increased production associated with oil sands, Canada's oil production has increased 75 percent since 2000, and the U.S. import of Canadian petroleum increased 50 percent over that time period (Figure 9).

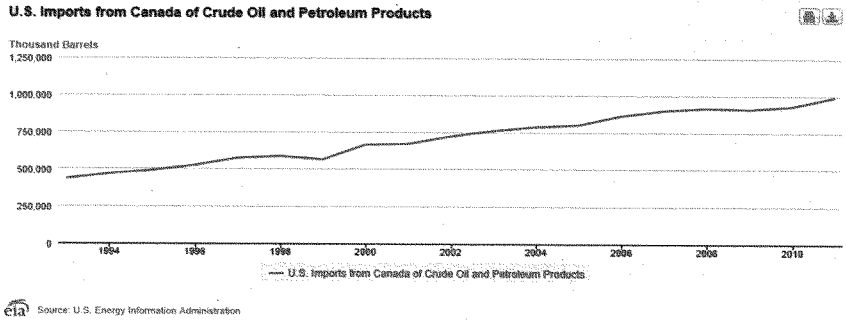
Figure 8: Net Imports and Domestic Petroleum Production[10]



Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 3.3a (April 2011), preliminary data.

Source: U.S. Energy Information Administration, *Petroleum Supply Monthly* (February 2011), preliminary data.

Figure 9: U.S. Imports from Canada of Crude Oil and Petroleum Products[11]



[10] U.S. Energy Information Administration, "Energy in Brief," June 24. 2011. Accessible at: http://www.eia.gov/energy_in_brief/foreign_oil_dependence.cfm

[11] U.S. Energy Information Administration, "Petroleum & Other Liquids," March 19, 2012. Accessible at: http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MTTIMUSCA1&f=A

Global Oil Production Environment

Key Conclusions of National Petroleum Council's *"Prudent Development"* Report

The National Petroleum Council (NPC) is a federally chartered advisory committee the purpose of which is to advise the Secretary of Energy on matters relating to oil and natural gas. As an advisory committee, the NPC provides advice at the request of the Secretary of Energy. In response to a request from Secretary of Energy Steven Chu, the NPC issued a report in September 2011 titled *"Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources."*[12] The report is a "comprehensive study to reassess the character and potential of North American natural gas and oil resources…"[13] The study reached four primary conclusions:

1.) "The potential supply of North American natural gas is far bigger than previously thought;
2.) North America's oil resources are also much larger than previously thought;
3.) Natural gas and oil resources will be needed even as energy efficiency reduces demand and lower-carbon alternatives become more economically available on a large scale; and,
4.) Realizing the benefits of natural gas and oil depends on environmentally responsible development."[14]

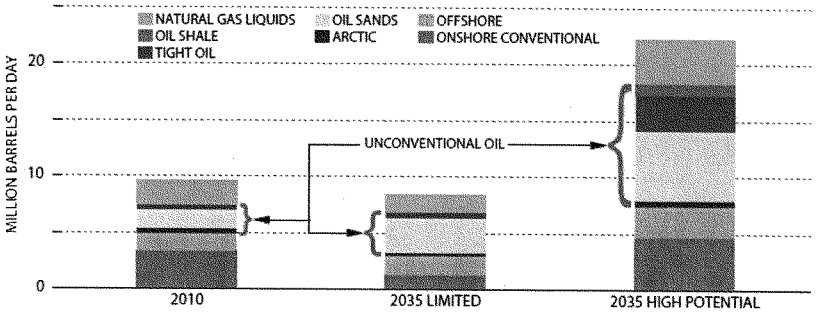
The first chapter of the report identifies crude oil and natural gas resources and supplies and considers the prospects for North American oil development with various challenges associated with different resource bases, including offshore, Arctic, onshore oil, unconventional oil, and pipeline infrastructure issues. (Figure 10) Within the various resource basis, the NPC estimates:[15]

- Currently technically recoverable in the Continental U.S. at nearly 60 billion barrels of oil;
- Arctic contains an estimated 100 billion barrels of recoverable oil;
- Alberta oil sands with a recoverable oil potential of more than 300 billion barrels;
- Onshore conventional oil estimated at 80 billion barrels,
- "Tight oil"[16] could produce an additional 34 billion barrels;
- Oil shale could yield resources estimated at 800 billion barrels.

[12] National Petroleum Council, *"Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources,"* September 15, 2011. Executive Summary accessible at: http://www.npc.org/reports/NARD-ExecSummVol.pdf
[13] NPC Executive Summary, p. 1
[14] Ibid.
[15] NPC "Prudent Development, p. 46.
[16] "Tight oil" is oil contained in traditional deposits, but could not flow through the tight formation rock, thus was traditionally inaccessible.

Figure 10: National Petroleum Council Resource Estimated Potential Production.

Figure ES-6. More Resource Access and Technology Innovation Could Substantially Increase North American Oil Production



Notes: The oil supply bars for 2035 represent the range of potential supply from each of the individual supply sources and types considered in this study. The specific factors that may constrain or enable development and production can be different for each supply type, but include such factors as whether access is enabled, infrastructure is developed, appropriate technology research and development is sustained, an appropriate regulatory framework is in place, and environmental performance is maintained.

Note that in 2010, oil demand for the U.S. and Canada combined was 22.45 million barrels per day. Thus, even in the high potential scenario, 2035 supply is lower than 2010 demand, implying a continued need for oil imports and participation in global trade.

Source: Historical data from Energy Information Administration and National Energy Board of Canada.

Resource Characterization and Potential Supply

Conventional resources are generally defined as those resources which are recovered from a reservoir in which oil, natural gas, and water accumulate in a layered arrangement. Conventional deposits have historically provided the majority of oil and natural gas production.[17]

Unconventional resources are then defined as what is not considered "conventional" - resources that cannot be produced, transported, or refined using traditional techniques. An unconventional deposit is one in which the distribution of oil and gas is throughout a geologic formation over a wide area, rather than within a discrete deposit. The NPC considers heavy oil, tight oil, oil shale, and oil sands as unconventional resources.

The NPC provides three categories of potential oil supply:

- "Oil in place" is an estimate of both the discovered and undiscovered oil, thus it is simply an approximation of how much oil is in the ground.

[17] Whitney, Gene; Behrens, Carl E.; Glover, Carol. Congressional Research Service, "Us Fossil Fuel Resources: Terminology, Reporting, and Summary." December 28, 2011. Accessible at: http://www.crs.gov/Products/R/PDF/R40872.pdf

- "Resources" refer to the oil volumes that are economically recoverable, as well as volumes that could be recovered in the future, but are not considered commercial at the time of estimation. Those unconventional resources that are not in commercial production at the time of estimation are not counted as "resources" because no oil can be economically produced with existing deployed technology.
- "Reserves," a sub-set of "resources," is the oil that can be produced economically with current technology at the time of estimation. This is also referred to as "proven reserves" or "economically recoverable reserves." Conversely, "ultimate potential" is an estimation of the amount of oil that could become recoverable with significant improvements in economic conditions and advancements in recovery technology.

Types of Unconventional Resources

Heavy Oil

Heavy oil, also known as bitumen, and has a higher viscosity and specific gravity than light crude oil. In North America, this resource is most prevalent in Canada, from a region termed the "heavy oil belt," and is similar to the production of Canadian oil sands. Oil in place in this region is estimated at over 35 billion barrels, and produced 382,000 barrels per day in 2009.[18] Current production techniques have facilitated development of the most easily accessible heavy oil resources, however further technology advancements can facilitate the ultimate potential of the resource.

Tight Oil

Tight oil is produced using a combination of horizontal wells and fracturing to unlock hydrocarbons locked in low permeability and porosity siltstones, sandstones, and carbonates, or shale plays. Notable tight oil plays include the Bakken in North Dakota, Montana, and Saskatchewan; the Eagle Ford in southern Texas; the Cardium in Alberta; and the Miocene in California (Figure 11). Recent technological advancements have turned tight oil resources into one of the "most actively explored and produced targets in North America."[19]

Estimations of tight oil potential are significant (Figure 12). The Bakken Formation in North Dakota alone contains estimated recoverable resources ranging from 3.65 billion barrels to 4.3 billion barrels; the USGS identified the Bakken as the largest continuous oil accumulation ever assessed by the agency.[20] Additionally, continued advancement of extraction technology and resource characterization may greatly expand this estimate.

[18] NPC Unconventional Oil White Paper, p. 11.
[19] NPC Unconventional Oil White Paper, p. 84.
[20] The group based these estimates on published literature, reports from state and gederal government agencies, and industry information. References also include USGS reports, and a NETL/DOE report.

Figure 11: Producing and Prospective Tight Oil Plays in the US and Canada[21]

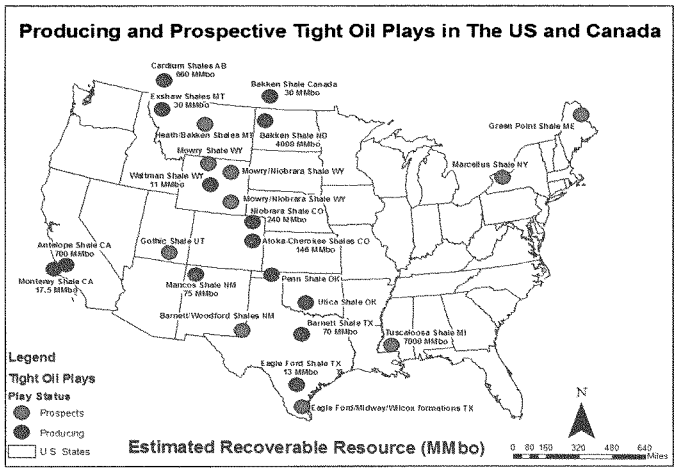


Figure 12: Estimates of Recoverable Resources for Producing Tight Oil Plays (BB = billion barrels) [22]

Table TO1 – Estimates of Recoverable Resources for Producing Tight Oil Plays

Formation	States/Provinces	Resources (BB)
Bakken	ND, MT, SK	3.650 to 4.300
Cardium	AB	0.660 to 1.890
Monterey (Antelope play)	CA	0.718 to 3.500
Niobrara	CO, WY	0.240
Atoka-Cherokee	CO	0.146
Mancos	NM	0.075
Barnett	TX	0.056
Exshaw	AB, MT	0.030
Eagle Ford	TX	0.013
Total		**5.588 to 10.25 (could be as high as 34 BB from NPC private industry data survey)**

[21] NPC, "Prudent Development," p. 121.
[22] NPC, Unconventional Oil White Paper, p. 87.

Oil Shale

Oil shale refers to deposits in which the petroleum component, kerogen, has not fully transformed into oil or gas; thus, the kerogen must be heated to transform it into an upgraded hydrocarbon. This physical state presents challenges to recover the resource which does not permit it being pumped directly from the ground. Oil shale must either be processed above ground (ex situ) or in place (in situ). Potential oil shale production in the US is estimated to be 6 trillion barrels of oil in place, mostly concentrated in the Green River Formation in Colorado, Utah, and Wyoming. However, due to the complexity of recovering the resource, only a fraction of the oil in place will be suitable for recovery.[23] Oil shale has a limited production history in the US, and currently there is no commercially-viable oil shale production in the US.

Oil Sands

Oil sands are a mixture of sand and other rock materials containing crude bitumen, thick viscous crude that can be in a near solid state at reservoir temperature. Production technologies vary as to the location and characteristics of various deposits, including mining and extraction technologies. Additionally in situ processes, such as steam assisted gravity drainage, cyclic steam stimulation, and solvent injection, are used for extraction and production.

In North America, significant oil sands deposits have been identified in both Canada and the United States. In Canada, oil-in-place estimates for oil sands have been estimated at 1.8 trillion barrels, vaulting Canada into second place behind Saudi Arabia for total oil reserves. (Figure 13)[24] Of this total, 7% or 131 billion barrels are estimated to be contained in shallow deposits, recoverable by surface mining or bitumen extraction. The remaining 93% are contained in deeper deposits which will require in situ recovery techniques. Estimates of US oil sands in place are

- Figure 13: Oil Sands Resources

State	Discovered (BB)	Undiscovered Bitumen-in-Place (BB)	OBIP (BB)
California	1.9	3.0	4.9
Utah	11.9	8.2	20.1
Texas	3.9	0.9	4.8
Oklahoma	ND	0.8	0.8
Alabama	1.8	4.7	6.5
Kentucky	1.7	1.7	3.4
Alaska	ND	19.0	19.0
New Mexico	0.1	0.2	0.3
Tri-State	0.2	2.7	2.9
Wyoming	0.1	0.1	0.2
Total	21.6	41.3	62.9

[23] The RAND Corporation has estimated that between 500-1100 billion barrels may be recoverable. Accessible at: http://www.rand.org/pubs/monographs/2005/RAND_MG414.pdf

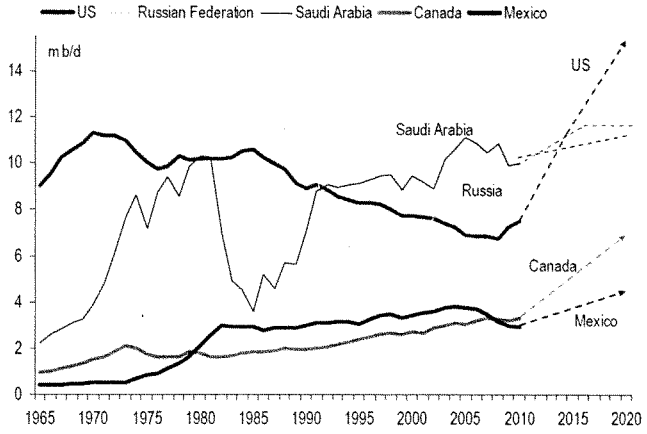
[24] NPC, Unconventional Oil White Paper, p. 72.

approximately 54 to 62.9 billion barrels spread across ten states.[25]

According to an analysis by Citi, the growth of unconventional oil resources, including the Canadian oil sands, tight oil and oil from shale, North American oil and gas liquids production could double by 2020 and overtake both Russia and Saudi Arabia in oil production (Figure 14).[26]

Figure 14: U.S. Unconventional Oil and Gas Production

Figure 8. US production could overtake Saudi Arabia and Russia's this decade



Source: BP, Citi Investment Research and Analysis

Key Technology Advances

A number of advances in key technologies have facilitated increased energy production in unconventional oil plays. For example, the use of "enhanced oil recovery," or injecting steam or a gas (typically carbon dioxide) into the ground to extract additional liquids from a previously drilled well, accounts for 19% of total onshore oil production in the lower 48 states.[27] Additionally, Canada's investment in in-situ technology facilitated the expansion of oil sands production.

[25] NPC Unconventional Oil Resources White Paper
[26] Citigroup, "Energy 2020: North America, the New Middle East?" March, 20, 2012. Accessible at: https://ir.citi.com/XrlJppnooam%2FCDzHLsIFFJI%2B2XIik7UrYk1deekRQLtTrCHYY%2Fkq2g%3D%3D
[27] NPC Prudent Development p. 106.

Oil Shale

The potential for the development of key production technologies may enable the production of oil shale, one of the world's largest unconventional hydrocarbon deposits. The NPC estimates oil shale sits at 8 trillion barrels of oil in place, approximately 6 trillion barrels of which is located in the United States and 80% of which lies under U.S. federal lands.[28] Historical efforts have been made to develop oil shale but tapered off as crude oil dropped in price throughout the 1990's.

However, interest in the huge potential of oil shale returned in the last decade, and pursuant to the Energy Policy Act of 2005, the Bureau of Land Management began development of a leasing program on federal lands that contain oil shale. The first round of research, development, and demonstration leases were awarded in 2006, and another round of leases were offered in 2009 but are yet to be awarded. On February 3, 2012, the Bureau of Land Management's proposed new regulations that would reportedly "reduce available lands for oil shale development in Colorado, Wyoming and Utah by more than 75 percent. In addition, it would only allow research on the leases until industry demonstrates that commercial development is technically viable and environmentally safe."[29]

Tight Oil: The Bakken Play

The development of the Bakken formation provides an illustrative example of how technology can greatly expand energy production. The advent of horizontal drilling, coupled with hydraulic fracturing stimulation, made the development of the Bakken fields, located in North Dakota economical.

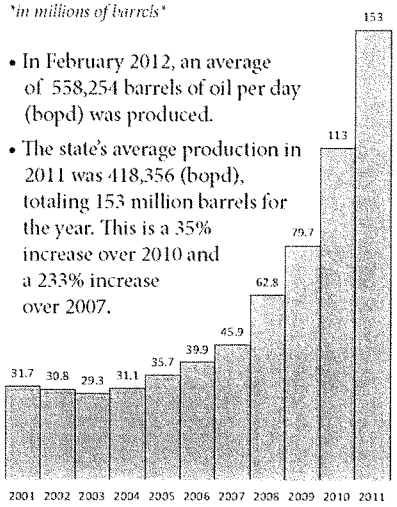
The Bakken formation occupies about 200,000 square miles of the subsurface of the Williston Basin, underlying parts of Montana, North Dakota, and Saskatchewan. First discovered in 1951, the rock formation consists of lower shale, middle dolomite, and upper shale. An April 2008 USGS report estimated the amount of technically recoverable oil, using readily available technology, within the Bakken Formation at 3.0 to 4.3 billion barrels, 25 times more than a 1995 estimate. The Bakken Formation estimate is larger than all other current USGS oil assessments of the lower 48 states and is the largest "continuous" oil accumulation ever assessed by the USGS.[30] The presence of vertical to sub-vertical natural fractures in the shale formation makes the Bakken an excellent candidate for horizontal drilling.

Energy production in the Bakken Formation has reshaped North Dakota's economy. North Dakota is now the third largest oil producing state, producing 558,254 MMbd.[31] (Figure 15) The unemployment rate is the lowest in the country at 3.1 percent[32] and the average wage in the oil

[28] NPC Prudent Development, p. 122.
[29] Taylor, Phil, *E&E Greenwire*, "Obama proposes rollback of shale plans for Rocky Mountain West," February 3, 2012. http://www.eenews.net/public/Greenwire/2012/02/03/1
[30] "Continuous" oil accumulation means that the oil resource is dispersed throughout a geologic formation rather than existing as discrete, localized occurrences http://www.usgs.gov/newsroom/article.asp?ID=1911
[31] North Dakota Oil & Gas Industry "Facts and Figures," Updated April 12, 2012Accessible at: http://www.ndoil.org/image/cache/Facts_and_Figures_2012_4.12.pdf
[32] U.S. Department of Labor, Bureau of Labor Statistics, "Unemployment Rates for States," March 30, 2012. Accessible at: http://www.bls.gov/web/laus/laumstrk.htm

and gas extraction industry was $89,020 in 2011.[33] In 2010, the oil and gas production industry contributed $749.5 million in taxes.[34]

Figure 15: North Dakota Crude Oil Production



[33] ND Oil & Gas "Facts and Figures."
[34] Ibid.

Chairman HALL. Good morning, and thank all of you. The Committee on Science, Space, and Technology will come to order. I want to welcome you to today's hearing entitled "Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology and Policy Pathways." In front of you are packets containing the written testimony of everybody.

Where is everybody? I guess they are still out watching the shuttle. But this is a very busy day with a lot of committee work going. I think they will be in and out of here. You didn't come all this way just to talk to two people; I know that. But it will go into the Congressional Record. Everybody is going to have to read your testimony whether they want to or not. So we welcome you here, and I might as well take the next five minutes and give time for the shuttle to land. They are going to Disneyland or wherever they are going.

I welcome you to this morning's hearing, and as I have said, it is entitled "Tapping America's Unconventional Oil Resources and Job Creation and Affordable Domestic Energy: Technology and Policy Pathways."

Currently, gas prices average just under $4 per gallon nationwide, and are expected to remain at that level through the spring and the summer, maybe go higher. These prices are hurting consumers and the economy, and have sparked yet another national debate on energy policy, and to address high energy prices, Republicans have long supported an "all of the above" approach, which includes expanding supply and production of our vast domestic energy resources and development of market-based solutions to reduce demand and increase energy efficiency.

In recent years, President Obama also adopted the Republican "all of the above" slogan to describe his own approach to energy policy. His Energy Secretary, Steven Chu, has changed his tune as well, taking back his remark that we need to "somehow boost the price of gasoline to the levels in Europe" only after standing by that statement for over three years and refusing to retract it before this Committee just in March and went across the Hill to the Senate and told them how he really felt.

When it comes to oil and gas drilling, however, the Administration's actions simply don't match the President's rhetoric. Pro-drilling actions at the federal level have been few and far between, and while the President works hard to claim credit for recent domestic energy production increases, it is important to note that these come primarily from state and private lands beyond the reach of his Administration or he would probably preclude them too.

Faced with a direct and urgent opportunity to address U.S. oil supply and infrastructure concerns, the President opposes drilling in ANWR, restricts development in the Gulf of Mexico and Outer Continental Shelf, rejects the Keystone XL pipeline, and blocks over a million acres of public land from oil shale development. But for these actions, America could be a seller of energy, not a buyer of energy. It is extremely difficult to consider this Administration's actions and conclude that the President's strategy can be objectively characterized as "all of the above."

Despite this backdrop, technology moves forward as is evidenced by the ability of recent advancements in horizontal drilling to safe-

ly and economically unlock vast amounts of oil. For example, in 1995, North Dakota was estimated to hold 150 million barrels of oil. Today, thanks to technology, it is estimated to hold 8 billion barrels. The economic benefits of this newly enabled production are very dramatic. North Dakota has the Nation's lowest unemployment rate, just 3.3 percent. Jobs are so plentiful in Williston, North Dakota, that the average salary is $90,000 per year and McDonald's is reportedly hiring new workers at $18 an hour with a signing bonus.

A true all-of-the-above policy would be aggressively looking to replicate the North Dakota economic success story. But instead of unleashing technological innovation and energy production, the President continues to ask multiple agencies to regulate, delay, and raise the costs of American energy production. Just this week, EPA is expected to issue new rules restricting emissions from oil and gas operations.

As the Committee, we feel responsible for overseeing the commercial application of energy technologies. We hope to learn more today about the status of and outlook for efficiently and economically increasing domestic oil production in the United States. We will explore challenges and opportunities resulting from new technologies such as horizontal drilling that are enabling expanded production, and we will discuss how continued technological development could position the United States as a top global energy producer for decades to come.

[The prepared statement of Mr. Hall follows:]

PREPARED STATEMENT OF CHAIRMAN RALPH HALL

Good morning, and welcome to this morning's hearing, entitled *Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology and Policy Pathways.*

Currently, gas prices average just under $4.00 per gallon nationwide, and are expected to remain at that level through the spring and summer. These prices are hurting consumers and the economy, and have sparked yet another national debate on energy policy.

To address high energy prices, Republicans have long supported an "all of the above" approach which includes expanding supply and production of our vast domestic energy resources and development of market-based solutions to reduce demand and increase energy efficiency.

In recent weeks, President Obama also adopted the Republican "all of the above" slogan to describe his own approach to energy policy. His Energy Secretary, Steven Chu, has changed his tune as well, taking back his remark that we need to "somehow boost the price of gasoline to the levels in Europe"—only after standing by that statement for over three years and refusing to retract it before this Committee in March.

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I now recognize Ranking Member Johnson for a five minute opening statement.

Chairman HALL. I now recognize Ranking Member Mrs. Johnson for a five minute opening statement.

Ms. JOHNSON. Thank you very much, Mr. Chairman, and welcome to all of the panelists.

This is an interesting topic for this Committee to examine today, and certainly, the oil and gas sector is one area in which we see how advances in science and engineering can translate into large-scale economic value, and our agencies have played a historic role in unconventional fossil research and development. But, being an election year and with gas price on their way to new heights, I have little confidence that the discussion will stay within the bounds of the jurisdiction of this Committee today.

Even as late as decades ago, we had little idea of the fossil resources that would be available today. But high energy prices and a healthy dose of geologic luck aligned with some critical research investments made by the Department of Energy over 30 years ago to bring new natural gas online, and with it, oil.

The Department of Energy program wrapped up in the early 1990s with a private company—when a private company took the research performed by DOE and ran with it to ignite the oil and gas boom we see today. I think my colleagues would agree that that is the model for applied research programs we all hope to see: federal investments shepherding transformational technologies to the marketplace, even when the path is not clear.

But that also begs the question: Being the Science, Space, and Technology Committee, what are we really here to discuss today? After all, it does not get much more commercial, much more profitable, than oil and gas. At a time of severe fiscal restraint, is it appropriate to talk about expanding the federal role in technology development for the oil and gas industry? What about the fear of government picking winners and losers, crowding out private investment, or otherwise engaging in market-supported activities that my Republican colleagues are usually so quick to malign clean tech research programs for supposedly perpetrating? How many decades and how many billions of taxpayer dollars can we spend picking the same winners?

If sustained high oil prices are not enough to drive further innovation in unconventional oil, is it really the job of the taxpayer to

buy-down the oil industry's risk? Are billions of taxpayer dollars in subsidies not enough of a handout for the most profitable industry in the world?

Maybe we are here to talk about the importance of oil to the economy. If so, don't worry; we get that.

I am from Dallas, Texas, and Democrats drive cars too. Oil and gas will play an important role in our Nation's economy for decades.

The real reason we are here today is that it is an election year, and this hearing is another installment in the losing campaign to pin the Nation's escalating gasoline prices on President Obama. To that, I add my voice to the bipartisan chorus of industry and policy experts that consider that as ridiculous as the notion that we can somehow drill our way into low gas prices and energy independence.

The Republicans' multi-million dollar effort to create an alternate reality in which a President controls gas prices is backfiring. The American people are smarter than that, and are coming to appreciate the real cost of our addiction to oil. Even if the oil comes from our own backyard, and I have relatives who had gas pumps in our backyards—I lived to see that—you pay the global price. The only guaranteed relief from the pain at the pump is to visit the pump less often. We need more transportation options, with cars and trucks that are dramatically more efficient, more alternative fuels, and more vehicle electrification. The cheapest gas is the gas you don't have to buy.

In closing, I would like to dispel the myth that President Obama and the Democrats are mounting a war on fossil fuels. We simply want future generations to have a choice. Where Democrats differ from our Republican counterparts is that we recognize that our Nation will be strengthened by diversifying our energy supply and protecting public health, and that is more important than short-term profits of industry. The oil will be there. It is up to the markets to make the price right, and the industry to make sure it can be produced sustainably.

Thank you, and I yield back, and I look forward to the testimony.

[The prepared statement of Ms. Johnson follows:]

PREPARED STATEMENT OF RANKING MEMBER EDDIE BERNICE JOHNSON

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Thank you, and I yield back.

Chairman HALL. I thank Ms. Johnson. We are neighbors and we are good friends, but we don't always agree. So the gentlelady yields back.

If there are Members who wish to submit additional opening statements, your statements will be added to the record at this point, or when they do arrive here.

Our first witness is Mr. Andrew Slaughter, Chair of the Resources and Supply Task Force of the National Petroleum Council's report entitled "Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources." He is currently the Business Environmental Manager for Shell's upstream America's exploration and production business. In this capacity, he is responsible for strategic counseling and analysis relative to North American crude oil and natural gas markets covering short- and long-term supply, demand, price and other regional market issues in support of investment, planning and business strategy.

Our second witness is Karen Harbert, President and Chief Executive Officer of the Institute for 21st Century Energy. Mrs. Harbert is the former Assistant Secretary for Policy and International Affairs at the U.S. Department of Energy and served as the Deputy Assistant Administrator for Latin America at the Caribbean and the U.S. Agency on International development. Mrs. Harbert re-

ceived her degree in international policy studies and political science from Rice University in Houston.

Our third witness today will be Dr. Michelle Michot Foss, the Chief Energy Economist of the Center for Energy Economics at the Bureau of Economic Geology at the University of Texas-Austin. Hook 'em, Horns. Dr. Foss has over 30 years of experience in energy and environmental. I couldn't help but put that in there. Dr. Foss's expertise is in applied energy economics and business development, enterprise strategy and commercial operations and business-government relations across the energy value chain. She received her Ph.D. in political science from the University of Houston, a master of science from the Colorado School of Mines and her bachelor of science from the University of Louisiana-Lafayette.

And then our next witness will be James Brown, President and Chief Operating Officer of Whiting Petroleum Corporation. Mr. Brown has served in his current capacity since January 2011. He previously served as Senior Vice President of Operations. Mr. Brown began his career with Shell Oil Company in Houston, Texas, in 1975 and he has held engineering and supervisory positions at American Petroleum, BP and Whiting Petroleum Corporation. Mr. Brown received his bachelor's degree in civil engineering from the University of Wyoming and a master's of business administration from the University of Denver.

Our final witness, or our last witness, will be Daniel Weiss, Senior Fellow and Director of Climate Strategy, center for American Progress. Before coming to American Progress, he spent 25 years working with environmental advocacy organizations and political campaigns. Mr. Weiss is an expert in energy and environmental policy, legislative strategy and tactics, and advocacy communications. Mr. Weiss received his master's of public policy and a bachelor of arts degree from the University of Michigan.

As our witnesses should know, spoken testimony is limited to five minutes, but you won't be held absolutely to that. You have come a long way and you have prepared many years, and you are kind enough to give us your time today. So we won't just hold you to that, but do your best to stay as close to it as you can. After which the Members of the Committee will have five minutes each to ask questions.

I now recognize our first witness, Mr. Slaughter, for your five minutes more or less.

STATEMENT OF MR. ANDREW SLAUGHTER, BUSINESS ENVIRONMENT ADVISOR, SHELL EXPLORATION AND PRODUCTION COMPANY, AND CHAIR, RESOURCES AND SUPPLY TASK FORCE OF THE NATIONAL PETROLEUM COUNCIL

Mr. SLAUGHTER. Good morning, and thank you, Mr. Chairman, Ranking Member, distinguished Committee. Thanks for the opportunity to be here and talk about unconventional oil resources in America and their future development.

As Mr. Chairman said, my name is Andrew Slaughter. I work on supply and market fundamentals for Shell. But today I am here in my capacity as Chairman of the Resources and Supply Task Group of the "Prudent Development" report, which was recently published

by the National Petroleum Council, an advisory body to the Secretary of Energy.

This report was a comprehensive assessment of North American oil and natural gas with a special focus on the environmental issues associated with development and of course the future productive capacity of that resource. The study was commissioned in September 2009. The final report was delivered in September 2011. And you can access and look at the report and all the backup materials on the National Petroleum Council website.

I did submit a written statement for the record with further background on the NPC, the Prudent Development study and its parameters. But today I will focus my shorter comments on the study's conclusions and recommendations, mainly addressing the size of unconventional resources and factors that could increase or decrease their productive potential.

Let me first clarify what we mean by unconventional. Unconventional resources are those oil and natural gas resources produced by other means than by producing from a defined reservoir through a vertical well bore using natural or induced pressure. So basically it is using some different technology or different production techniques to produce the resource. These include heavy oil, bitumen or kerogen produced through in situ thermal recovery. It includes tight oil produced from source rock using horizontal drilling and multistage hydraulic fracturing. And on the gas side, it includes such resources as shale gas, tight gas and coal bed methane.

So with regard to the scope of these resources, we analyzed virtually every non-proprietary resource assessment conducted by government agencies, the private sector and many organizations from the United States and Canada, and the conclusion was, the ultimate potential of the North American unconventional oil resource is huge. It is composed of several distinct resources, each at a different stage of development. The unconventional oil in place in the United States and Canada was estimated to be about 3–1/2 trillion barrels of oil with technical recoverable resources today of about 180 billion barrels. By comparison, the total conventional oil resource in the United States is about 185 billion barrels. In terms of natural gas, we have about 2,000 to 5,000 TCF of technically recoverable resource. About half to two-third could be considered unconventional.

So this leads to a potential for production. It is important to say that not all the oil in place will be produced. We concluded that about 1.1 trillion barrels could be ultimately recoverable. And of that, approximately just under 180 billion barrels are recoverable using technology in place today. With new technology and technology development, an additional 1 trillion barrels is probably ultimately recoverable with technology and other advances over the next years and decades.

So in 2010, the United States and Canada produced 10 million barrels a day together. Approximately 2 million barrels a day came from unconventional plays, mainly the oil sands, and 3 million barrels a day came from natural gas liquids, much of which comes with unconventional gas production.

So there are potential development pathways for these resources that depend on choices that are made from policy and the invest-

ment and technology. In a limited production case, total 2035 production was estimated at 10 million barrels a day, but with a growing contribution from unconventional oil up to 3–1/2 million barrels a day. But in a high potential case, if we get supportive policy, access and fiscal support, total North American production can grow to over 20 million barrels a day by 2035 with further potential thereafter, and unconventional oil comes to about 10 million barrels a day in that total. The oil shale resource is not included in those totals but could be of huge development potential thereafter.

For each of these sources of unconventional supply, the path to production is unique. Oil and gas technology could lead to surprisingly rapid production growth for tight oil but other unconventional resources will be developed over a much longer time period.

I will finish up here by just saying there are some three principal recommendation areas to support prudent development of these resources. First, establish an independent forum to research the facts and potential of all the unconventional hydrocarbon space to inform policy. Second, put policies in place to support innovation and production growth, particularly stable leasing access and fiscal regimes and technology support regimes. And finally, work very closely with Canada, who have a very successful track history in developing unconventional oil resources, particularly in the Alberta oil sands.

And with that, I will conclude my remarks. My apologies for running over time.

[The prepared statement of Mr. Slaughter follows:]

Testimony of Andrew Slaughter
Business Environment Advisor, Shell Exploration and Production Company
and
Chair, Resources and Supply Task Group of the National Petroleum Council
Before the House Committee on Science, Space and Technology

April 17, 2012

Mr. Chairman, Mr. Ranking Member, distinguished committee members; thank you for the opportunity to be here today to talk about America's unconventional oil resources and the potential for their development. I am here today in my capacity as a contributor to the recent National Petroleum Council Study, "Prudent Development - Realizing the Potential of North America's Abundant Natural Gas and Oil Resources". For this study I was the chairman of the Resources and Supply Task Group which focused on hydrocarbon resources and development potential in the U.S. and Canada. I also work for Shell where I focus on analyzing North American natural gas and crude oil markets.

The National Petroleum Council (NPC) Study was undertaken in response to a request from Secretary of Energy Dr. Chu to assess North American resources of natural gas and oil; describe their development potential; describe the key technologies which will be used in this development; set out how development can be achieved while ensuring high standards of environmental performance and management of community impacts; and analyze the contribution which greater use of natural gas can make in reducing CO2 and other air emissions, while achieving objectives of environmental protection, economic growth, and energy security. The study was commissioned in September 2009 and the final report was delivered in September 2011. The study report, 55 supporting topic papers, and other study materials are publically available on the NPC's website (www.npc.org).

The NPC is a Federally chartered, self-funded Advisory Committee with the sole purpose of providing advice to the Secretary of Energy and Executive Branch by conducting studies at their request. It is not an advocacy group and does not lobby. NPC study participants represent diverse interests and expertise relating to the topic being addressed. There were over 400 participants involved in the study that produced the NPC's "Prudent Development" Report, the majority of which were from organizations outside of the oil and gas industry.

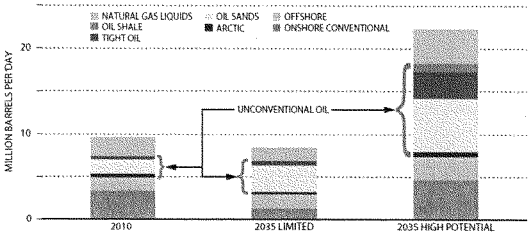
The Task Group which I chaired was composed of almost 100 experienced industry professionals, academics and experts from government agencies, and set out to describe the natural gas and oil resources available for development in the U.S. and Canada; potential pathways for development and production over the next two to four decades, laying out the enabling conditions which could favour a pathway to higher production and the challenges or barriers which could constrain production growth; and the key technologies, current and future, which will need to be developed and deployed.

The Task Group undertook a comprehensive review of the following hydrocarbon resource types: offshore oil and natural gas; Arctic oil and natural gas; onshore conventional oil and enhanced oil recovery; unconventional oil; and onshore natural gas. We also studied crude oil and natural gas infrastructure needs; hydrocarbon resource assessments; and we reviewed and analyzed a wide range of publicly available studies on these topics as well as undertaking a survey of proprietary outlooks from oil and gas companies and consulting firms.

Since the focus of this hearing is on unconventional oil, I propose to concentrate my remarks in this area, although I would also be pleased and willing to answer questions about other segments of North American hydrocarbon supply potential.

We define unconventional oil as oil resources which require non-traditional production techniques and technologies to be developed and produced; in contrast to conventional oil which is usually produced from a defined reservoir through a vertical wellbore using natural or induced pressure. In the case of unconventional oil, non-conventional production techniques include mining or in-situ thermal recovery of heavy oil, bitumens and kerogen. We include heavy oil, very heavy, oil shale and oil sands in this category of unconventional oil. Unconventional oil can also include such resources as tight oil, which is usually light and sweet, but which is extracted from source rock using horizontal drilling and multi-stage hydraulic fracturing techniques similar to those deployed in shale gas plays.

Figure 1-5. More Resource Access and Technology Innovation Could Substantially Increase North American Oil Production



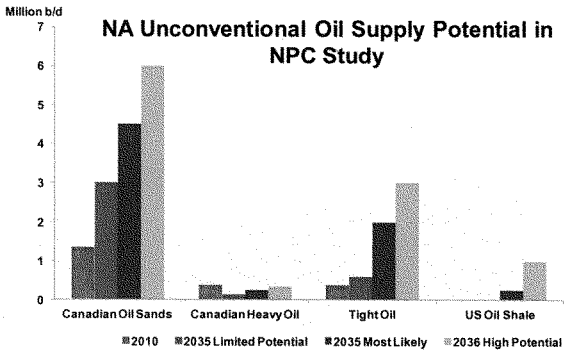
Note: The oil supply bars for 2035 represent the range of potential supply from each of the individual supply sources and types considered in this study. The specific factors that may constrain or enable development and production can be different for each supply type, but include such factors as whether access is enabled, infrastructure is developed, appropriate technology research and development is sustained, an appropriate regulatory framework is in place, and environmental performance is maintained.

Source: Historical data from Energy Information Administration and National Energy Board of Canada.

The study team found that the ultimate potential of North American unconventional oil is huge. Oil in place is estimated at over 3.5 trillion barrels, with recoverable resources using known technology standing at over 177 billion barrels. This compares with about 185 billion barrels of technically recoverable conventional oil resources in the U.S. And with future technological developments, we may ultimately be able to recover over 1 trillion barrels of all these resources with sustained advances in appropriate technologies and operating practices. Moving towards ultimate potential will take decades, not years, but requires sustained activity in developing appraisal, drilling and recovery technologies and operating practices; and recognition from policy-makers and regulators that regulatory, fiscal and leasing frameworks need to take into account the specific complexities of these resources.

The NPC study took an in-depth look at how the resources identified could be developed into production over the next couple of decades (as well as the conventional oil resources in North America). Figure 1.5

from the Executive Summary of the report shows the range of potential production and highlights how unconventional crude oil might be developed compared to conventional oil. It included production from both the U.S. and Canada, as we considered the two countries to represent essentially one large market for oil supply. The chart shows that, out of 2010 total production of just under 10 million b/d, approximately 2 million barrels per day came from what we would consider unconventional plays, predominantly the Alberta oil sands; and a further 3 million barrels per day or so came from natural gas liquids, much of which was associated with unconventional natural gas production.



The two other bars on the chart represent the potential range of North American oil production by 2035.

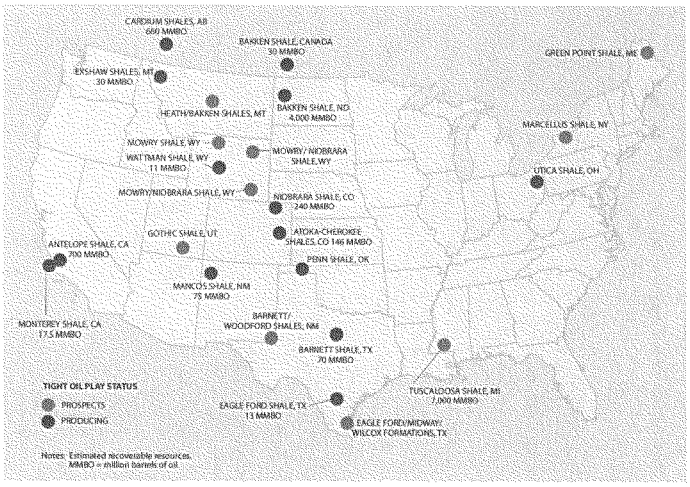
The Limited outlook assumes that development of new plays and expansion of existing plays proceed quite slowly, inhibited by restrictions on access, restrictive leasing frameworks, a lower capacity to develop appropriate technologies and a lower pace of infrastructure development. Even in this more limited outlook, however, there could be an expanded role for unconventional oil, growing to over 3.5 million b/d, with growth from the Alberta oil sands and from U.S. tight oil. Indeed, in this more restricted oil development scenario, unconventional oil would represent a growing share of the total as the more conventional sources decline as a result of the lack of new development, combined with continuing depletion of existing mature reservoirs.

In the High Potential scenario, shown on the right of this chart, the study team assessed that total North American oil production could rise to over 22 million b/d by 2035, if more favorable development conditions are assured by governments, regulators and oil and companies alike. Of this 22 million b/d, the study team estimated that about 7 million b/d could come from unconventional sources with a further 5-6 million b/d coming from natural gas liquids, again much of which should be expected to be associated with unconventional natural gas production.

The following chart breaks out the individual components of unconventional oil included in the overall ranges of production. We can see that the highest scope for increases is still expected to come from the Alberta oil sands, with their vast resources of identified hydrocarbons. But US tight oil could also become a significant contributor over this time period, reaching at least 3 million b/d by 2035. In fact, over the course of the NPC study and in the time since it has been completed our understanding of tight

oil resources and their potential to grow production increased substantially. And it is quite conceivable that even the high potential case shown here understates the scope of production which may be achievable.

The following map shows the principal areas of current and potential development of tight oil, as known today. It is, of course, quite possible, that, as with shale gas, more prospective areas are identified as more knowledge and experience is acquired. (The map makes an estimate of recoverable resources for some tight oil plays using published literature, reports from states and government agencies, and industry press releases. These estimates could be low - many of the tight oil plays are in early stages of development and resources may be significantly greater than currently reported).



It is worth clarifying at this point that US oil shale, although it represents a massive hydrocarbon resource, even in the most favourable scenario for development, should not be expected to have as much impact as oil sands and tight oil in this time frame. However, in order to be available for ramp-up to significant volumes in subsequent decades, a sustained effort in leasing, research and technology development will be needed in the near-term. Since unconventional resources will mostly require unique new techniques to extract the oil, learning from the Canadian oil sands example, the yardstick

for measuring the successful development and deployment of new technologies is decades – not years. Other factors to support growth include -- fiscal measures to spur growth and reduce risk, and long term land access agreements so that operators have time to develop and deploy new extraction ideas.

Now let me turn to the key technologies which can influence these potential outcomes and which will be needed if the higher potential production profiles are to be achieved. For unconventional oil, new technologies include both methods to extract the oil economically, and, since unconventional oil generally has a higher environmental footprint than conventional oil, ways to reduce environmental impacts from production.

First let me address tight oil. In this case, the successes over the past five years in unconventional and shale natural gas development really opened the path for the subsequent take-off of tight oil development. The impact of new technology application has been to revitalize areas which have in the past seen significant oil and natural gas development, but which had mostly been perceived as largely "played out" such as in the Williston Basin of North Dakota and Montana, home of the Bakken play.

The key to opening up the new tight oil resources has been the application of new extraction methods - horizontal drilling, combined with multi-stage hydraulic fracturing. At this level, the technology is similar to that used to open up shale gas plays. However, specific use of technology is conditioned by the specific geologic conditions encountered in each location. Rock permeability and porosity conditions vary as do depth and pressure. The design of drilling and completion strategies in each basin needs to be tailored to local conditions. Technology improvements as these developments go forward will be around better identification of oil location within the formations, optimum placement of fractures and flow monitoring systems which can track the performance of individual fractures. And , on the environmental technologies and operating practices side, operators need to develop new techniques that both reduce overall water use and manage the water flows as an integrated cycle from water acquisition to water disposal. Recycling of water will be increasingly necessary as the volume of activity increases. In addition to the above technologies, a multitude of other technological advances have continued to improve the identification of resources, reduce costs, and/or increase recoveries of tight oil and other resources.

In the North American context, the development of the Alberta oil sands is also a key component of expanded oil supply. For the first 20 years, the oil sands industry has been focused on developing technology that could extract the oil economically. Over the next 20 years, the focuses will be on the environmental technologies. a clearer understanding of the technologies used and how environmental impacts are managed for the region as whole is an important for consideration for Canadian policy makers and regulators. As supply grows, methods to reduce the environmental footprint of extraction, and to ensure that the growth stays within the regional environmental limits is a key focus.. There are two broad categories of oil sands extraction – 1) surface mining, in which shallow deposits of bitumen are removed using truck and shovel techniques and then treated to remove bitumen from the other mined materials; and 2) in-situ extraction, used in deeper deposits, hot steam injection is used to increase bitumen viscosity so it can flow to the surface. There are various in-situ technologies available

and operators are continuously testing new approaches to increase efficiency, environmental impacts, and recovery rates and/or to lower operating costs. These approaches are discussed in more detail in the "Unconventional Oil" topic paper of the recent NPC study, and it is worth stressing here that, with the opportunity to develop these resources, the industry has been extremely proactive in developing improvements in technology, operating practices and environmental performance in all its aspects, to enable continued expansion of the production . For example, the industry has lowered its GHG emissions intensity per barrel by 39 percent from 1990 to 2008[1].

In fact, the Alberta oil sands development could, in many respects, serve as a template for unconventional oil development in many other areas of the U.S. and Canada. Industry, provincial and federal governments and regulatory agencies have consistently worked together to develop appropriate access, leasing frameworks, regulations and environmental standards which have together enabled steady expansion of capacity over many years, allowing the economic and energy security benefits of these resources to be achieved, whilst also driving continued improvement in environmental management. A constructive learning from the Canadian oil sands, which could be applied to other unconventional resources, is to undertake a full assessment of the environmental and social impacts early to allow for long term planning, and integration of mitigation strategies early in the resources development.

The Alberta oil sands has reached its current position as a world-class oil province, both in terms of current production and future growth, after decades of patient, sustained effort by all involved to assemble an operating and regulatory framework which works well for all participants, allowing substantial benefits to be realized. In the U.S. we can see a possible parallel in the development of oil shale in the Rocky Mountain states. Again, here various attempts have been made over the past 40 years or so to build large-scale production, commensurate with the immense size of the available resource. However, as yet, cost-effective and environmentally appropriate development and producing technologies have not yet emerged to move into sustainable high-volume production, and this process might take several more decades and enormous capital commitments from the oil and gas companies. To enable these development pathways to proceed with confidence, broad and consistent government engagement is required to provide some degree of long-term regulatory certainty. On the technology front, a broad partnership of industry, academia and government research facilities would be desirable to allow a range of concepts to be developed and tested. If these regulatory frameworks and technology development efforts are not put in place and sustained, then we may not be ready to tap into these vast resources when there is a clear need in the market, later this century. We should not let our current and near-term successes in such resources as tight oil distract us from preparing for the long-term when new sources of oil will surely be required.

[1] National Inventory Report 1990---2008: Greenhouse Gas Sources and Sinks in Canada" Environment Canada (2010) Available athttp://www.ec.gc.ca/Publications/default.asp?lang=En&xml=492D914C---2EAB47AB---AO45---c62B2CDACC29 Part I, Page 69

There are other types of unconventional oil which we have identified, such as heavy and extra-heavy oil, and US oil sands. Others may emerge in the coming years and decades. Together with the vast, world-class producing and prospective basins in North America for conventional oil, such in the offshore, around all the coastlines of the lower-48 states (not just the Gulf of Mexico); in the Arctic regions of the U.S. and Canada; and in the application of new drilling techniques and enhanced oil recovery methods to fields which may have previously been considered as mature, North America has the prospect of maintaining and building on its position as one of the major oil producers of the world for many years to come. Although there are significant uncertainties about the future size of the North American oil market (and these will be addressed in the forthcoming NPC study on the future of Transportation Fuels), the opportunity to produce a much larger share of domestic consumption from North American sources is real and demonstrated. Unconventional oil has added a new dimension to what was already a rich portfolio of oil development options. In considering current and future energy policy, we urge policy makers to take all necessary steps to keep these options on the table, allowing capital to be deployed, technology to be developed and significant energy security and economic benefits to be achieved. There are challenges to many of these prospects. But industry can overcome these challenges by being allowed to proceed with development and technological advances. The continuous history of this industry has been one of ever-increasing productivity and technological intensity, allied with ever-improving environmental performance and engagement with the communities where we operate. Government and policy-makers have an important role to play in setting out a framework for activity which recognizes the contribution of the resource potential, while addressing the needs of wider groups of stakeholders.

Chairman HALL. We thank you for your own time. Thank you, sir.

Now I recognize Mrs. Harbert.

**STATEMENT OF MS. KAREN HARBERT,
PRESIDENT AND CHIEF EXECUTIVE OFFICER,
INSTITUTE FOR 21ST CENTURY ENERGY,
U.S. CHAMBER OF COMMERCE**

Ms. HARBERT. Thank you, Chairman Hall and Ranking Member Johnson, Members of the Committee. I represent the Institute for 21st Century Energy, which is an affiliate of the U.S. Chamber of Commerce.

I really appreciate the opportunity to discuss an issue area that gets very little coverage in the public policy debate. That is the potential benefits and the existing obstacles to greater development of our vast unconventional oil and natural gas resources. Rarely does public debate include the fact that America has hundreds of years of supply stored in unconventional formations in the United States. In fact, Colorado, Wyoming and Utah alone contain more oil from oil shale than all of the conventional oil contained in the Middle East. These resources are so vast that when made commercial, they have the real potential to completely alter the global oil market and secure America's energy future. Yet today we have a policy in this government to ignore the value of these resources, sacrifice the revenue, the jobs and security dividends that we could realize from developing them.

After the Arab oil embargo, the price of oil increased tenfold by 1980, and as a response, the United States began a very big development program for domestic oil including oil sands and oil shale as a hedge against future supply disruptions. Canada took a similar tack. However, in the mid-1980s we saw the price of oil decline precipitously and the United States stopped that program. Canada, notably, did not, and Canada saw its oil production double between 1982 and 2008, and the United States saw its production decrease by 43 percent.

The International Energy Agency says that global energy demand is going to go up by 50 percent by 2035, and in that time frame, fossil fuels will still dominate 80 percent of our energy landscape. Countries around the world are increasing their production and looking to acquire assets abroad but the United States is on a different course. Under this Administration, more than 86 percent of federal offshore lands and 83 percent of federal interior lands are off limits for exploration. The Interior's Bureau of Land Management reduced the acreage for oil shale activities in Colorado, Utah and Wyoming by over three-quarters and it reduced available acreage in eastern Utah as it relates to oil sands by nearly 80 percent.

Recent claims that U.S. oil production is up are accurate but the reason is much more telling. Production of oil from federal lands is down 11 percent comparing 2011 to 2010 but is increased by 14 percent on private and state lands. And of course, we also have to remember, we are paying more for what we import. In fact, we are accounting—our imports account for 60 percent of our total trade deficit, and fuel prices are dominating the political and legislative

debate for good reason. Every 1-cent increase in the price of gasoline costs Americans roughly $1 billion a year. The average American household spent about 8.5 percent of its household income on gasoline, which is the highest since 1981. And let us not forget that every $10 increase in oil prices can knock a few tenths of a percent off any increase in GDP.

Yes, it is true, there are a few mechanisms that the Federal Government has its disposal to immediately lower fuel prices but it is not accurate to say that the government can do nothing to affect prices in the future. A signal to the global energy market that the U.S. is committed and serious about accelerating the development of its vast conventional and unconventional oil resources would not go unnoticed. Introduction of new supply from the North Slope of Alaska or the North Sea in the early 1980s helped cause the global price to collapse in 1986. And new commercial production in Alberta also impacted global prices. So similarly, our unconventional resources have the potential to be the game changer our U.S. economy needs and upon which our future competitiveness can depend.

According to the U.S. government, the country has an estimated 2.7 trillion barrels of oil in place of oil shale and oil sands but 80 percent of it is located on federal lands. These resources would supply ourselves for at least 380 years. These resources are twice the size of the entire world's proven conventional oil reserves of 1.3 trillion barrels.

A paper by Anton Dammer, who is the U.S. government's former head of oil shale reserves, said if we were to develop our oil shale and oil sands resources as Congress instructed in 2005 in the Energy Policy Act, over the next 25 years we could realize a gain in oil production of 1.1 billion barrels. We could increase economic growth by $153 billion, government revenue by $31 billion, and not send $129 billion overseas to finance our demand for energy. Congress was clear in 2005 when it created an interagency task force to look at this and make recommendations, and the Administration complied with that in 2008 and made those recommendations. This Administration is now walking those backwards. We are taking lands off the table. We are picking energy favorites and we are trumping the Nation's strategic interests. Lack of access has prevented oil shale development technologies from aggressing as far as the oil sands in Canada. But we need access to federal lands, not just private lands.

As such, the policy pathway to realizing even a portion of this huge asset is to allow access to our unconventional resources which are in control of the Federal Government. This Administration has ignored Congress's mandate, and unless this approach changes, our largest strategic asset will remain untapped until this or a subsequent Administration decides to allow access to these strategic assets and to secure our energy future. America's business depends on that decision. Thank you.

[The prepared statement of Ms. Harbert follows:]

Committee on Science, Space, & Technology
United States House of Representatives

"Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology & Policy Pathways"

Testimony of Karen A. Harbert
President & Chief Executive Officer
Institute for 21st Century Energy
U.S. Chamber of Commerce

Tuesday, April 17th, 2012

Thank you, Chairman Hall, Ranking Member Johnson, and members of the Committee. I am Karen Harbert, President and CEO of the Institute for 21st Century Energy (Institute), an affiliate of the U.S. Chamber of Commerce. The U.S. Chamber of Commerce is the world's largest business federation, representing the interests of more than three million businesses and organizations of every size, sector and region.

The mission of the Institute is to unify policymakers, regulators, business leaders, and the American public behind common sense energy strategy to help keep America secure, prosperous, and clean. In that regard we hope to be of service to this Committee, this Congress as a whole, and the administration.

I appreciate this opportunity to discuss an issue area that gets very little coverage in the public policy debate, the potential benefits and the existing obstacles to greater development of the nation's vast unconventional oil and natural gas resources. There has been much discussion about America's oil reserves recently, but rarely does it accurately capture the full extent of our resources. The country's unconventional oil resources are some of, if not the largest the world and one of the single greatest assets we as Americans possess.

We have hundreds of years of oil supply stored in unconventional formations in the United States. In fact, the three states of Colorado, Wyoming and Utah alone contain more oil from oil shale than all of the conventional oil contained in the Middle East. This resource is so vast that when made commercial, it has the real potential to completely alter the global oil markets and secure America's energy future at the same time. Yet it is the current policy of our government to ignore the value of these resources, sacrificing the revenue, jobs and huge security dividends Americans would realize from developing them.

Historical Context

After the Arab oil embargo, the price of a barrel of oil almost doubled between 1973 and 1974. By 1980, the price of oil had increased more than tenfold since 1972. In response, the United States, along with most of the Western world, reshuffled its energy policy with a focus on weaning itself off imported oil to insulate it from another supply disruption. Efforts were made by the Department of Energy and private industry to begin a Research and Development (R&D) program to foster technology that could economically produce our unconventional oil resources, primarily focused on our vast oil shale deposits. Canada began similar programs to develop its huge supply of oil sands in Alberta.

However, between 1980 and 1986 oil prices declined by more than 60%, falling by nearly half between 1985 and 1986 alone. In the United States, this decline served as justification to stop virtually all federal R&D focused on unconventional oil. Canada however, maintained its commitment to developing unconventional resources and has seen oil production more than double between 1982 and 2008. Over that same period U.S. domestic oil production declined by 43%.

Yet in 2009, the United States began to see an increase in domestic oil production, the first year-to-year increase since 1985. Innovation in the private sector has generated this nascent renaissance. The combination of hydraulic fracturing and horizontal drilling has catalyzed an energy revolution in America, enabling the economic production of trillions of cubic feet of natural gas from shale formations around the country. More recently industry has evolved these technologies further to produce millions of barrels of oil, putting us on a path that could quite possibly make the United States the largest oil producer in the world once again. If the federal government were to allow access to the country's tremendous unconventional resources, our production levels could completely reshape the current geopolitical paradigm that has existed for more than 40 years.

These innovations originated in the oil fields of north Texas in the late 1970s, when an experienced and single-minded oilman named George Phydias Mitchell defied the conventional wisdom in the industry, the advice of his employees, and sometimes even the will of his shareholders and invested millions of dollars attempting to produce gas from the Barnett shale formation. Under his direction, Mitchell Energy pioneered the use hydraulic fracturing to unleash methane from this thin, but dense shale formation. Ultimately Devon Energy purchased Mitchell Energy in 2001 and married Mitchell's experience fracking shale formations with its experience using horizontal drilling technology to make it the pioneer of shale exploration and production.

While it was risk-taking entrepreneurs in the private sector like George Mitchell who created these innovations, the federal government has also played a role in making the technology more efficient and safer, as well as accelerating its development. In 1991, the National Energy

Technology Lab collaborated with Mitchell Energy's first horizontal well in the Barnett and brought a significant body of technological knowledge and experience to Mitchell's operation, informed by its own work in the Eastern Gas Shales Project started in 1976. The federal government lacks the mission or technical capability to develop these commercial technologies. First movers in industry tend to lack broader data and comparative experience that can be applied to use of their technology to improve efficiencies. Together though, cooperative work between the National Laboratories and the private sector has helped accelerate technological innovation. This is the same type of cooperation that Americans expect when it comes to the development of our unconventional oil assets, but are no longer receiving.

Federal Energy Policy Impact on Competitiveness

Current federal policies that hamper production not only threaten our energy security, but also severely undermine our competitiveness. The International Energy Agency (IEA) projects that global energy demand could increase by nearly 50% by 2035. It also projects that fossil fuels will account for 80% of the world's energy supply, only slightly down from today's 86%. Fossil fuels, and oil specifically, will continue to fuel the world's economies, and countries that are realizing the most economic growth are thinking and acting strategically to ensure future supplies will be available to maintain economic growth and competitiveness.

International competitors are not only increasing their own production, but they are exploiting the tie between their governments and their oil companies to invest in new oil reserves in other countries. It is very difficult for a private corporation, no matter how large it may be, to compete against central governments. These other countries are taking positive steps to ensure they have the energy resources to fuel economic growth well into the future.

However, the United States is set on an opposite course. Under this administration, more than 86% of federal OCS lands and 83% of federal interior lands are completely off limits to energy exploration. In 2008, the Department of Interior's Bureau of Land Management (BLM) proposed making up to 2 million acres of public lands available for commercial oil shale leasing in Utah, Colorado, and Wyoming and 431,000 acres available for oil sands leasing in Utah. In February 2012, the BLM retreated from that proposal and significantly reduced the acreage available for industry to undertake research and development activities. Specifically, BLM reduced the acreages for oil shale activities in Colorado, Utah and Wyoming by over three-quarters, from 2 million to 461,965 acres. In addition, BLM reduced available acreage in eastern Utah for activities related to oil sands development by nearly 80%, from 431,000 to 91,045 acres.

Not only has the federal government been reducing access to the country's energy resources, but it has also been making it more difficult and expensive to produce on the areas that remain available. New and proposed regulations will add to the cost of production, making it even less attractive for industry to invest and produce oil in the U.S. The largest publicly traded oil

companies are increasingly looking overseas to the remaining areas that have not already been locked up by other countries' national oil companies.

Demand for oil will continue to increase as the global economy recovers and the developing world's thirst for energy only grows. The claim that U.S. oil production is rising is accurate but the reason is even more telling. Production of oil from federal lands is down 11% from 2011 compared to 2010 but has increased by 14% on private and state lands. The picture is equally as lopsided for production of natural gas, which is down 6% on federal lands but is up 12% on private lands. The most significant reserves are located on public lands so this trend is not sustainable over the long term. Without increased access to federal resources, we will see a return to more of our demand being met by imports.

And, of course, we are paying more for what we do import. Our net imports of petroleum and related products rose to $331 billion in 2011, accounting for 60% of our total trade deficit and about two-thirds of the trade deficits increase from 2010.

In short, America's access to oil, our predominant source of energy, is declining at home and abroad. The same cannot be said for our global competitors, and our ability to compete, generate investment and revenue and foster economic growth is tremendously diminished as a result.

Market Influence on Innovation and Production

The recent significant increase in domestic oil production has not occurred in a vacuum. It is important to note that geologists have been aware of the shale resources that have spurred increased domestic production for decades. However, it was not until sustained increases in global demand put oil prices on a relatively predictable upwards trajectory did it become economical to commercially deploy the new technology to produce shale oil resources at the levels we are now seeing.

After oil prices climbed to a record-high $143 per barrel in July 2008, the U.S. and the world entered an economic recession that significantly curbed demand, causing oil prices to plummet 60% over the next seven months. Since then, much of the world began positive economic growth again, led by developing economies like China and India, resulting in a gradual increase in oil prices until last year. Over the past three years, we have seen oil prices triple. However, because demand was down in the U.S. and the increase was gradual, most Americans did not really notice it until recently. The recent political turmoil in North Africa and the Persian Gulf created fears of further instability and supply disruptions, and prices climbed precipitously. It is important to understand that even if the political unrest subsides and global supplies are unaffected, increased global demand has essentially recalibrated the oil market. Given today's market fundamentals, it is difficult to see prices returning to the low prices seen in 2009.

This presumption has created a level of certainty necessary for the private sector to invest billions of dollars over the past three years in oil-bearing shale formations. It also creates the

necessary certainty for the private sector to invest in our other unconventional resources like oil shale and oil sands if it were allowed access to those resources.

Impacts of Fuel Prices on Business & the Economy

Fuel prices have taken an increasingly central role in the political and legislative debate over the last few months, and for good reason—it is a drag on economic growth and acts as an effective tax on American families and business. The cost of transporting goods, getting to work and even driving to the grocery store has increased 140% since January, 2009.

Every one cent increase in the price of gasoline costs Americans roughly an additional $1 billion per annum. The average American household spent $4,155 on gasoline in 2011, consuming 8.4% of median household income, the highest since 1981. Additionally, each $10 increase in oil prices can knock a few tenths of a percent off any increase in GDP. The quicker the increase, the more pronounced the impact on economic growth. Because of the recent global recession, the cumulative amount of money spent on oil has become a larger share of global GDP since most other areas of economic output have remained constant or declined. In 2011 oil accounted for more than 5% of global GDP, a level not seen since 2008 when oil was selling at $150. Based on 2012 projections from IEA, oil's share of GDP could approach 6% in 2012, the highest mark since the tumultuous 1970s.

Higher energy prices erode expendable income for America's families and marginal profits for America's businesses. At a time where we are just beginning to realize positive economic growth again, these price increases can have a profoundly negative impact. U.S. policy alone cannot recalibrate global oil markets on its own. However, U.S. policy can absolutely have a positive impact on U.S. prices just as it has had a negative impact.

As energy costs increase, businesses have less money to pay employees, new or existing. If prices remain elevated long enough, the unemployment rate can be expected to rise. This, of course, would be on top of the current prolonged high unemployment rate. As the administration and some in Congress have made calls to raise taxes on the oil and gas industry, it is also important to remember the consumer and job impacts such policies would have.

While it is factually accurate to say that there are very few mechanisms at the federal government's disposal to lower fuel prices immediately, it is not accurate that the government can do nothing to affect prices in the future. A signal to the global energy market that the U.S. is committed to accelerating the development of its vast conventional and unconventional oil resources would not go unnoticed. It is also not true that increased U.S. production could never be large enough to impact global prices and any claim to the contrary demonstrates either unawareness of the country's massive unconventional oil resources or a willful attempt to hide our potential. One need only look back to the first half 1980s to see the impact the addition of oil production from Alaska's North Slope and other areas such as the North Sea had on putting downward pressure on the world price of oil, contributing to the collapse in global price in 1986.

The acceleration of oil sands production in Alberta in the early 2000s is another, more recent example. Similarly, our unconventional resources have the potential to be the gamechanger the U.S. economy needs and upon which our future competitiveness can depend.

Potential Benefits of Increased Unconventional Production

According to a recent Inventory of U.S. Energy Resources produced by the Institute for Energy Research from official U.S. government data, the country has an estimated 2.7 *trillion* barrels of in-place oil shale and oil sands resources, more than 80% of which is located on federal lands. At current levels of consumption, these resources would meet our demand for more than 380 years. These resources are twice the size of the entire world's proven conventional oil reserves of 1.3 trillion barrels. However, current technology would only allow for production of a fraction of the total resources. The Energy Information Administration estimates that the Green River Formation in Colorado, Utah, and Wyoming contains 800 billion barrels of recoverable oil.

A white paper released last month[1] by Anton Dammer and James Bunger updates previous government estimates and finds that by developing our oil shale and oil sands resources as Congress instructed in 2005, over the next 25 years we could realize a gain in oil production of 1.1 billion barrels, increase economic growth by $153 billion, increase government revenue by $31 billion, and avoid sending overseas $129 billion for imported oil.

The paper noted that original government estimates that were delivered to Congress in 2007 were much higher but the current administration has been adversarial to development of these resources, eroding any progress that had been made in the previous administration. The paper recounts that a Task Force consisting of the Departments of Interior, Energy, and Defense had worked to fulfill Congress' mandate through 2008. The Task Force inventoried unconventional resources, current R&D work being conducted, and the state of current technology and recommended a strategic plan for accelerating the development of these resources. Additionally, the Department of Interior finalized a Programmatic Environmental Impact Statement (PEIS), produced a Resource Management Plan, promulgated new leasing regulations, and awarded six Research, Development, and Demonstration leases to industry. Implementation of Congress' mandate was on underway and on schedule at the end of 2008.

Since then, the current administration has essentially killed this effort against the will of Congress. The Department of Interior has withdrawn the leasing program, publicly suggested that terms of existing leases and the Resource Management Plan are under review, and chose not to defend itself in a lawsuit that has killed the leasing program. Moreover, the Unconventional Fuels Program at the Department of Energy has been de-funded and abandoned. The Department of Interior's new PEIS severely limits new acreage. These actions have spoken loud

[1] A. Dammer & J. Bunger, *Economic Impacts of Failure to Implement Legislative Mandates of Section 369 of the Energy Policy Act of 2005,* March 2012.

and clear to the private sector…do not invest your capital in the development of unconventional oil production

Similar to what has happened in the production of oil and natural gas from shale formations, industry has been forced to focus on development on state and private lands. While the current hydrocarbon boom demonstrates that industry's innovation and perseverance can sometimes trump governmental obstinace, it should not have to do so. Our energy future is being compromised by the administration picking energy favorites and trumping the nation's strategic interests.

Technology & Policy Pathways to Expand Production

Industry has developed many different potential methods to develop both oil sands and oil shale resources. In both cases hydrocarbons are trapped in no viscous elements. While oil sands contain producible hydrocarbons, oil shale must be chemically converted to produce hydrocarbons. Because Canada had the foresight to maintain a commitment to unconventional R&D and production, there is a tremendous body of commercial technology that supports oil sands production. As the technology has evolved, it has become more efficient and has considerably lessened its environmental impact. In fact, Albertan oil sands development has become so common-place that it no longer even merits the designation of "unconventional".

In the initial stages of oil sands production, soil was mined from the surface and then manufactured into crude oil. Recently however, there has been a major shift towards *in situ*, or "in place" production, whereby heat either through steam or other mediums is applied to the oil sands bitumen to increase its viscosity to the point that it is produced via traditional oil drilling techniques. In situ production has significantly reduced land disturbance and environmental footprint. While U.S. oil sands are chemically divergent from those in Canada, the innovation and experience in Alberta provides a tremendous starting point for production here…if and when the government was to allow access to our oil sands resources.

Lack of access and economic conditions have prevented oil shale development technology from progressing as far as that for oil sands. However, like oil sands, crude oil can be produced from oil shale through surface mining or via *in situ* methods. Because shale is solid rock, oil shale kerogen must be exposed to higher temperatures to render its hydrocarbons. Industry does believe that knowledge gained in the Albertan oil sands will directly benefit development of U.S. oil shale…if and when the government was to allow access to our oil shale resources. Unlike production of oil and natural gas from shale formations, there is relatively little oil shale to develop on state and private lands. Without access to federal oil shale resources, industry has very little incentive to invest capital into technology when it has no reason to expect that it will ever be able commercially produce oil shale deposits and recoup its R&D investment.

As such, the policy pathway to realizing even a portion of this huge asset is to allow access to our unconventional resources for production. Congress made its will known through its

overwhelmingly bipartisan support for the Energy Policy Act of 2005. This administration has ignored its mandate and refuses to move forward with production of unconventional oil on federal lands. Unless this near-sighted approach changes, our largest strategic assets will remain subterranean potential assets until this, or subsequent administrations decide to allow access to these strategic assets and secure our energy future.

Chairman HALL. Thank you, and well said, Ms. Harbert. Thank you.

I now recognize Dr. Michot Foss for five minutes, and I must warn you that when I said hook 'em Horns, the lady in red here sent me a note, also put in the record, gig 'em, Aggies, so they are equal, and since I have a granddaughter down at A&M, I am forced to say that. We recognize you now for five minutes.

STATEMENT OF DR. MICHELLE MICHOT FOSS,
CHIEF ENERGY ECONOMIST,
CENTER FOR ENERGY ECONOMICS,
BUREAU OF ECONOMIC GEOLOGY,
UNIVERSITY OF TEXAS–AUSTINBUREAU
OF ECONOMIC GEOLOGY,
UNIVERSITY OF TEXAS–AUSTIN

Dr. FOSS. Thank you, Mr. Chairman, Ranking Member Johnson and Members of the Committee. Thank you so much for inviting me to join you today, and Chairman Hall, it is nice to see you again and see you looking well. And let me say I am agnostic. I have degrees from lots of different universities and support them all.

I will add some comments to the record to supplement what my colleagues have said already and to make a few key points that I think are important for us to consider as you debate all of these issues.

First of all, in my view, our major concerns should be about replenishment and deliverability. I include some information in my testimony to demonstrate long-term efficiency of the industry, the U.S. industry. It is remarkable, really, how well the industry has performed over time to sustain the ability to deliver hydrocarbons when we need them and where we need them. That is really the key thing is keeping that cycle going. It is a long process to develop ideas, to develop prospectively, to make the investments, to yield the supply, to serve the market, and it can't be interrupted. Any interruption is what creates distortions and disruptions that impact customers.

The essential industry capability to maintain a long-term reasonably steady balance between reserves and production is one of the most important ingredients to U.S. energy security and long-term prosperity. We really have to keep that in mind.

I want to make a point. A robust resource base, we have known for a longtime that we have a robust resource base. This alone does not fully protect producers and consumers from short swings in price but it is key to restoring market balances at times when we have very fast economic growth and we have constraints in the system.

Now, the Committee asked me to take on four very large questions, and I have attempted to do my best to address those. The first one had to do with primary economic factors that shape energy markets and prices with a focus on gasoline. First and foremost, global oil markets are a complex daily dance, and I put in a wonderful and very complex and detailed chart that we came up for the U.S. Department of Energy's Energy Information Administration to try to illustrate all of the interactions that occur between buyers and sellers, producers and customers, intermediaries, coun-

tries, governments, independent and international companies, traders, brokers, shippers, transporters and so on to try to deliver what we really demand, which are the products from crude oil, not the raw material itself. Price level is most immediately impacted by cost of incremental supply to serve incremental demand at any one time, and we look at lot at surplus capacity worldwide. We measure it. We try to monitor it as best we can. One of the most important things that U.S. government agencies can do is keep the transparency between us and producing countries open and vital and vibrant so that we can get the data that we need to understand where at any one point in time deliverability worldwide exists, and I showed an illustration of that using the OPEC data and some points that you can ponder. Whenever world demand grows as quickly as it has during the 2000s when we have supply capacity constraints, you can expect an increase in price, and that is what happened.

Variation also in price comes from incremental demand in the United States, regionally, interregionally and intraregionally, differences been domestic and international crude prices, which is very strong right now, the cost of inputs like steel and raw materials that are essential for drilling, production and processing, and let me say also that when it comes to the cost of inputs, these are critical not just for oil and gas operations but all energy technologies. So we have to think about preserving our ability to supply inputs not just oil and gas production but also for alternative energy technologies, renewable technologies and everything else that use the same raw material inputs and require a hefty industrial base to be able to supply those.

With regard to the potential impacts of supply and production on energy prices in the national economy, we all know that there are huge benefits that are delivered by the oil and gas industries every day in terms of jobs and related benefits for households and local economies and assortment of other things, but we have to keep in mind that these fuels and materials are important for the overall national economy and really focus on that. What do these products and the supply of these products on a competitive basis do for the overall U.S. economy, not just local job creation in any one place where the industry is active?

Hydrocarbons provide a greater measure of energy density than other forms of energy. This is a key point that way too often gets missed in the debate about what we should do and how we should do it. This means that on a unit energy basis, hydrocarbons actually yield environmental benefits over other energy technologies that have lower energy densities and are therefore harder and more expensive to build up, to scale up and to manage when it comes to intermittent use.

Natural gas and gas-fired electricity have provided relief from more expensive oil and gas products so we have savings today. We have been having savings to consumers for the past year or so because of lower natural gas prices and commensurately lower electricity prices.

Finally, on the point of economic benefits, I want to make an addition to Andrew's statements on the NPC study. I was on the industrial subcommittee for that report. There was a lot of discussion

about what supports manufacturing in the United States, and some very strong views about the role of not just energy but all aspects of macroeconomic and monetary policy in the United States. Industrial growth is more strongly linked to gross domestic product than any other factor. Energy is important but it is a relatively small part of the cost of the manufacturing base in the United States. So many things affect the health of the manufacturing sector. So much has to be done if we want to actually build that sector back up. It goes well beyond energy. But in terms of understanding what we can do with our energy supplies, I included an example from the trucking industry. This is new information that was presented to me just recently on the status of the trucking industry itself. We are looking at using incremental natural gas supply as a clean fuel for trucking operations in a liquefied form in particular but trucking companies are having a hard time recruiting drivers. They have to deal also with a great deal of federal and state regulatory compliance. They face high cost structures, poor infrastructure and all of the other things that affect the ability to move goods when and where we need them in the United States, and so I think that is a very good example to look to for the full picture of things that affect our energy space.

When it comes to regulatory and supply chain hurdles, we have a great deal of investment that needs to take place in the midstream businesses, pipelines, gas processing, raw material processing for the crude oil side. We have existing fairways that have been very efficient in moving product, mainly to the Gulf Coast. Those fairways need to be expanded and we actually need to do some replumbing of our midstream network in the United States to be able to move oil and natural gas and natural gas liquids to different locations in the mid-continent, the Northeast and other places where new capacity is needed.

Unconventional plays are helping to insulate us against Gulf of Mexico issues but I want to put into the record that we have to sustain production from the Gulf of Mexico. There is no choice. That is just too vital a province for the United States.

Finally, on the role of technology, I appreciate all of the comments about the role of federally supported technology and the importance of all of that. I included an example for everyone in order to understand the lead times. I think it is worth thinking about the 30 years that it took before horizontal drilling, just horizontal drilling by itself, finally topped 50 percent of the overall market for drilling services in the United States. I have intermittent experience with that. I worked for Matt Simmons at Simmons and Company International when the first horizontal drilling transaction was done in the late 1980s. It is a long haul to get this stuff working and to have it function the way that it needs to so that the industry can benefit from all of those examples, all of those technologies.

To close, when it comes to regulatory and policy bottlenecks and the things you all can do, the Ranking Member mentioned taxes. Yes, the oil and gas industry is profitable. It is also one of the largest, if not the largest, taxpaying industries in the country at all jurisdictions, federal, state and local. Last time I checked, Apple was actually more valuable than any one I believe of the energy compa-

nies, at least on a cash basis, pays relatively little in taxes, I might add, along with General Electric and a few others. So I think we have to put some perspective on all of that. These companies pay a great deal into the federal treasury, state and local treasuries, into households and taxpayers' pocketbooks, and I think it is important to recognize that and understand that benefit that gets created. Thank you very much.

[The prepared statement of Dr.. Foss follows:]

Dr. Michelle Michot Foss
Bureau of Economic Geology/Center for Energy Economics
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Testimony on
"TAPPING AMERICA'S UNCONVENTIONAL OIL RESOURCES FOR JOB CREATION AND AFFORDABLE DOMESTIC ENERGY: TECHNOLOGY AND POLICY PATHWAYS"
April 17, 2012

SUMMARY

- Our major concerns should be about **replenishment** and **deliverability**.
- The essential industry capability to maintain a long term, reasonably steady balance between reserves and production is one of the most important ingredients for U.S. energy security and long term prosperity.
- A robust resource base does not fully protect producers and customers from sharp swings in price but sustaining a robust resource base is essential to restoring market balance.

On primary economic factors that shape energy markets and prices, with a focus on oil and gasoline:

- Global oil markets are a complex daily dance
- Price level is most immediately impacted by cost of incremental supply to serve incremental demand. Unconventional resource plays sit firmly at the expensive end of the marginal cost curve for oil supply.
- Variation between domestic and international crude price and regional demand within the U.S. explains much of gasoline price differences.
- Increasing global incremental demand for oil relative to incremental supply and supply capacity create upward price pressure.

On potential impacts of supply and production on energy prices and the national economy:

- While a significant effort has been made to demonstrate economic benefits and impact from oil and gas industry operations, it is the much larger set of benefits and multipliers from overall provision and use of competitively supplied and delivered fuels and materials that underlies economic value.
- Hydrocarbons provide a greater measure of energy density, yielding environmental benefits that are usually not measured.
- Competitively supplied and priced energy can provide enormous economic benefits. Natural gas and gas-fired electricity have provided relief from more expensive oil and oil products. Industrial growth is more strongly linked to gross domestic product (GDP) than any other factor; the trucking industry provides a good example of constraints.

On impacts on energy markets of regulatory and supply chain hurdles faced by energy exploration and production firms:

- "Debottlenecking" the oil and gas transportation and storage system requires transparent, sensible, and timely certification of facilities.
- Unconventional plays are helping to insulate against GOM issues, but GOM production must continue.
- Sustaining socioeconomic benefits will require a competitive tax and business environment and thoughtful and flexible environmental regulatory oversight. Reducing cycle time is a key consideration.

On the role of and potential for technology advances in driving current and future energy production and impacting prices:

- Technology development and deployment is crucial to ensuring competitive supply and pricing but entails long lead times.

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Testimony on
"TAPPING AMERICA'S UNCONVENTIONAL OIL RESOURCES FOR JOB CREATION AND AFFORDABLE DOMESTIC ENERGY: TECHNOLOGY AND POLICY PATHWAYS"
April 17, 2012

Mr. Chairman and members of the Committee on Science, Space, and Technology, I am Michelle Michot Foss, Chief Energy Economist, and Head of the Bureau of Economic Geology's Center for Energy Economics, based in the Jackson School of Geosciences at The University of Texas. I am pleased and honored to be selected as a witness for the Committee.

My testimony today follows on similar testimony presented almost exactly one year ago, on March 17, 2011, before the Committee on Natural Resources (CNR). In that previous testimony, I laid out a "high altitude" case for the economic and environmental benefits of hydrocarbons, touching on markets, technology, policy, and regulation, and offering specific ideas on what can be done to harvest domestic energy resources for the betterment of our society.

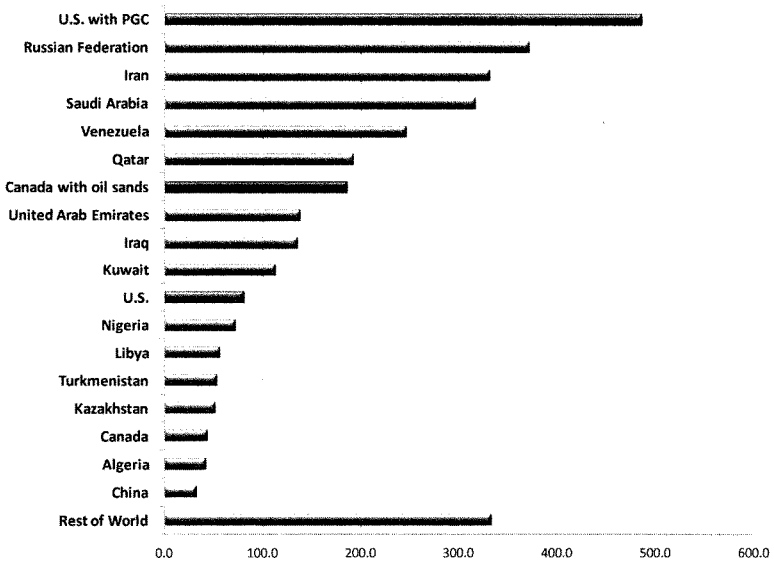
During the intervening year, nothing has happened to alter my views regarding the underlying, fundamental forces impacting prices of the major energy commodities. Indeed, all of the work I and my colleagues have simply reinforces our opinions regarding the intrinsic and extrinsic forces that impact commodity markets and prices.[1] However, since spring a year ago, there are added complexities and nuances, new challenges, new ideas, and new consequences, unintended or otherwise, to consider.

One of the key "known knowns" is the richness of our domestic natural resource base. To make that point, I've repeated a chart from the 2011 testimony. This chart illustrates data on proved reserves of oil and natural gas (in barrel of oil equivalent terms). As before, I've added the estimated total U.S. natural gas supply (proved reserves plus total natural gas resources, deemed technically recoverable) from the Potential Gas Committee's 2010 report. I've also added an estimate of Canadian oil sands reserves. When we consider technically recoverable resources estimated by PGC, our hydrocarbons endowment tops the known and understood worldwide distribution of hydrocarbon wealth. In fairness, if other

[1] Dr. Michot Foss and CEE researchers were selected by U.S. Energy Information Administration (USEIA) to provide an independent expert memo on oil market dynamics and pricing. Our final report was submitted in April 2011.

countries in this list provided the same kind of transparent scrutiny of their resource endowments, some could easily top the U.S. It also is not possible to say whether all of the total future natural gas supply of some 2,100 trillion cubic feet (TCF) will ever be produced. To a large extent, how much of that future supply could be realized in annual production is the subject of this hearing. Of importance is that we are learning, once again, **the same lesson** we've learned many times but can't seem to accept: we have a **rich resource endowment**, and a **nimble, inventive, and deep industry bench**. Whenever supply-demand conditions yield an **attractive price signal** that suggests imbalance, companies and investors **respond quickly**. **Private land and minerals holdings** enable fast response for leasing and testing new play concepts. **Technology and service providers** combine with operating savvy to push the envelope yet again in a way that **challenges preconceived notions about U.S. productivity and longevity**. As the cycle progresses, **research and development** are mobilized to tackle the next tranche of resource recovery challenges. The outcome is **downward pressure** on both of our major commodity price indexes (Henry Hub for natural gas, West Texas Intermediate for crude oil). Spreads have widened between our domestic prices and international indexes. This reality, along with the large price premium of oil against natural gas, is unleashing disruptive forces that could lead to long term shifts in how we develop and use these resources and in international trade patterns.

Top Reserve Holders (Billion Barrels of Oil Equivalent)



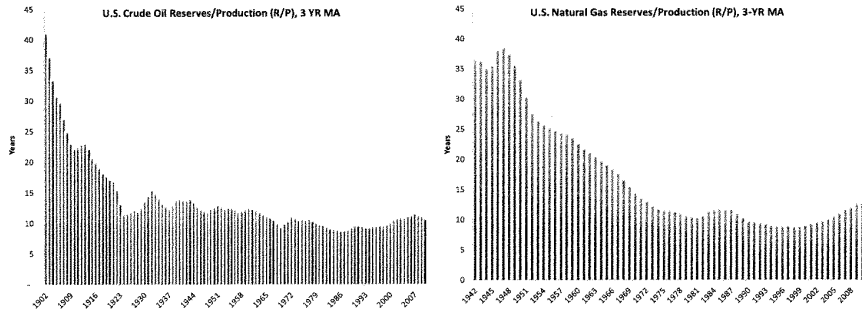
CEE-UT analysis based on BP Annual Statistical Review, Potential Gas Agency and industry reports.

Dr. Michot Foss, CEE/BEG-UT, 3

I've also updated and included charts from May 2010 testimony before the CNR on oil and natural gas reserves replacement in the U.S. (see top charts, next page). Our major concerns should be about **replenishment** and **deliverability**. Replenishment is the vital activity of finding new resources and proving up new reserves that enables sustained production going forward. Deliverability is the amount of supply that can enter the market at any time to meet demand. The questions posed regarding potential regulatory and supply chain hurdles hit home most squarely on our ability to sustain a base of hydrocarbon reserves and deliver production from those reserve on an ongoing basis. The long view I've provided on reserves to production (R/P), using a three-year moving average, demonstrates industry responsiveness (see bottom charts, next page). R/P provides a rough measure of performance. Wartime needs and post-war economic growth diminished R/Ps for both crude oil and natural gas (as did increased industry efficiency and improved inventory management). Our vibrant industry and markets have allowed operators to stabilize and, when robust business conditions exist, increase R/P ratios. **This essential capacity – industry capability to maintain a long term, reasonably steady balance between reserves and production – is one of the most important ingredients for U.S. energy security and long term prosperity.**

Importantly, **a robust resource base does not fully protect producers and customers from sharp swings in price**. Short and mid-term deliverability can be impacted by any number of factors, ranging from natural disasters to operational events to pronounced business cycles. Oil and natural gas are commodities for which we are all price takers. However, **sustaining a robust resource base is essential to restoring market balance.** Coupled with operational and market flexibility, ever advancing technology, and a more elastic policy and regulatory environment, a robust resource base can help mitigate swings in price. We are entering a phase in which continued deliverability of natural gas from dry (nonassociated) producing locations, which constitute the bulk of natural gas supply capacity, will be challenged by the low price environment. In testimony last year, I emphasized the shift in drilling already taking place as higher oil prices lure capital investment away from pure natural gas plays and into locations that are "liquids rich". We continue to receive pipeline imports of natural gas from Canada, and as liquefied natural gas (LNG) from other locations. But at some point, natural gas prices will rise; increased demand for low priced natural gas and stronger economic recovery will hasten that adjustment. The expectation is that the robust shale gas resource base that has been proved up along with conventional play opportunities will facilitate responsiveness. Constraints to responsiveness, such as midstream bottlenecks or policy and regulatory hurdles, would exacerbate imbalances. **In the history of our natural gas industry, the U.S. has had plenty of experience with policy and regulatory induced imbalances.** On the oil side, going forward, the Gulf of Mexico remains a critical component of our replenishment and deliverability system. Midstream bottlenecks are preventing cheaper crude oil and liquids from entering the market. These bottlenecks could impact dry gas deliverability since, in the low natural gas price environment, associated gas production would become more important for deliverability. Refining remains a challenging business segment.

U.S. Crude Oil and Natural Gas Replenishment, U.S. Production Rankings, and R/P Ratios



CEE analysis using USEIA and industry data.

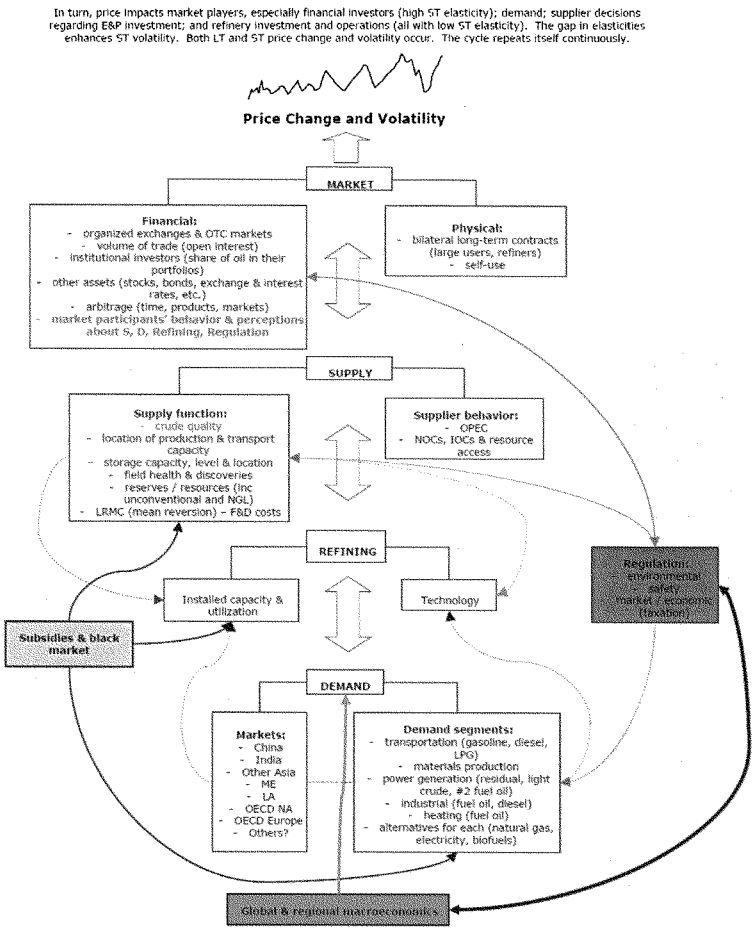
Dr. Michot Foss, CEE/BEG-UT, 5

With this background, I turn to the four key questions posed by the Chairman and Committee.

1. Primary economic factors that shape energy markets and prices, with a focus on oil and gasoline.

In our expert opinion to USEIA on oil markets, we provided the chart shown below.

Conceptual Organization of the Global Oil Marketplace



CEE, 2011.

Dr. Michot Foss, CEE/BEG-UT, 6

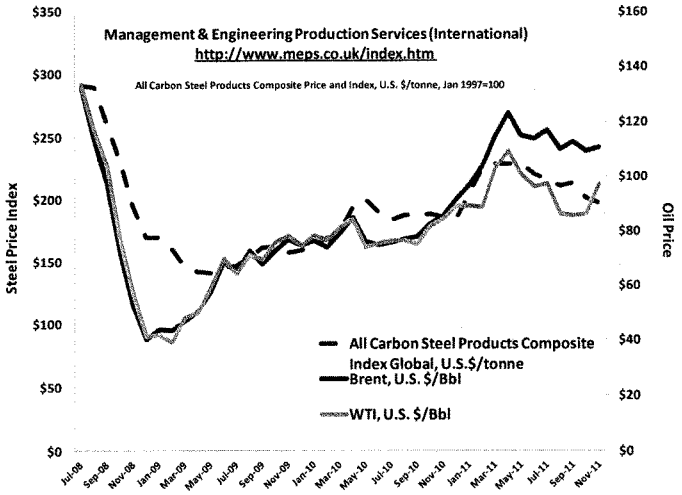
Global oil markets are a complex daily dance between supply and demand, involving large infrastructure systems (producing fields, storage facilities, shipping, pipelines, refineries). Numerous commercial (entities engaged in oil operations) and noncommercial participants engage in a huge financial market in which "paper" barrels facilitate the exchange of "physical" barrels and provide a means of price risk management. We feel that the most important drivers of oil and gasoline prices are the following.

- **Cost of incremental supply**

Price level is most immediately impacted by cost of incremental supply to serve incremental demand. As demand grows, oil supplies are delivered from ever more expensive supply sources. When demand falls, with commensurate drops in oil prices, the most expensive supply sources are abandoned first. In our work for EIA, we showed that **oil price and full, breakeven finding and development (F&D) cost are highly correlated**; price can be predicted from F&D cost in systematic ways. On average, depending upon other conditions, price needs to be 3-4 times greater than F&D cost to cover all expenses and provide a sufficient return on investment to spur drilling.

A coincident indicator of F&D cost is steel, a major input for oil and gas operations. The chart below illustrates, the strong, roughly 74 percent correlation between oil price and a common steel products price index. Higher demand for steel, and thus higher prices, impact oil and gas extraction cost. Higher oil and gas prices impact the cost of making steel.

Steel Price Index and Oil Prices – A Coincident Link



Unconventional resource plays sit firmly at the expensive end of the marginal cost curve for oil supply. Subsurface conditions are more rigorous; specialized technology and manpower are expensive. To guarantee success, and to be able to operate through price cycles, operators must continually strive to reduce cost on a unit (barrel) basis. They can do this by scaling up production volumes, so long as business conditions and other constraints (like policy and regulation) permit. Technology adaptations can help to eventually improve recovery rates, a target for sustainability and future pathways in unconventional plays, thus lowering costs and supporting profitability.

- **Variation between domestic and international crude prices and regional demand within the U.S.**

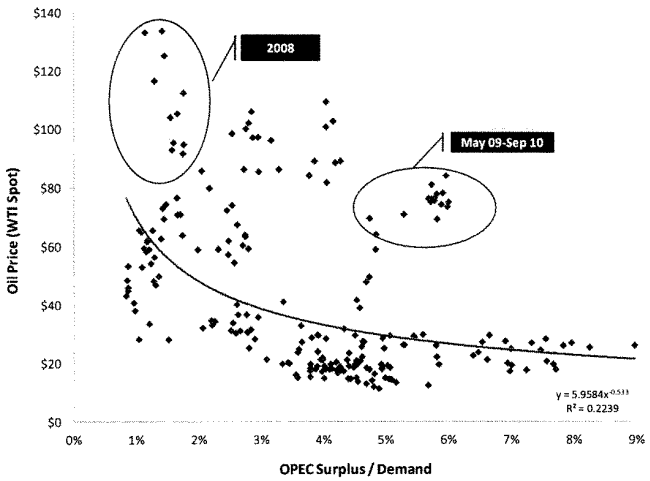
The preceding chart also serves to capture the **increasing differential** between Brent oil price, an international index, and WTI, our domestic index. Normally very closely linked, WTI has been heavily influenced by domestic exploration and production success and midstream, midcontinent bottlenecks that have created a **persistent surplus** at the Cushing, Oklahoma price point and within PADD 2 (Petroleum Administration Defense District). Refineries in our heavily populated coastal areas typically import crude feedstock priced on Brent. The disparity between WTI and Brent contributes to variation in gasoline prices (other major contributors being environmental regulations and various state rules for reformulated gasolines and differences in regional consumption patterns across the U.S.). **Prices are much higher in large coastal markets that rely on imported crude feedstock**, and much lower in the less dense U.S. midcontinent. The differential extents to natural gas liquids (NGLs) that tend to be higher valued; NGLs (propane, butane, ethane and so on) are cheaper in midcontinent locations and more expensive on the Gulf Coast where the bulk of ethane fractionation and petrochemical capacity is located.

- **Global incremental demand for oil relative to incremental supply and supply capacity.**

Also in our expert report for EIA, we adapted and modified a chart EIA typically uses to track **elasticity in global oil markets**. For the time being, and the foreseeable future, members of the Organization of Petroleum Exporting Countries (OPEC) have the best ability to maintain surplus production capacity, Saudi Arabia in particular. When global demand kicks to higher gear, or when particular geopolitical events, natural disasters or other occurrences create real or perceived disruptions, information about OPEC spare capacity can help to both dampen price movements but also send an important signal that additional increments of supply are necessary. As shown in the chart below, **when OPEC spare capacity is tight relative to demand (the OPEC surplus/demand ratio), oil price tends to be higher**. This was clearly the case at the peak of the past oil price cycle in 2008. **When spare capacity is ample relative to demand, price tends to be lower.** This was the case during the drop in oil prices from May 2009 to September 2010, largely a function of broad economic recession in the U.S. and Europe. With time and continued domestic production gains and given our status as a major oil consumer, **our resource base can help to reduce fears about chronic oil**

shortages. Consequently, replenishment and deliverability in the U.S. oil sector can contribute to greater international energy security.

Oil Price and OPEC Spare Capacity



CEE analysis using EIA data.

2. Potential impacts of supply and production on energy prices and the national economy.

Energy is essential for economic development and well-being. Hydrocarbons offer a multitude of benefits, ranging from the value associated with discreet molecules for materials and feedstocks to the energy products and services derived from them. **While a significant effort has been made to demonstrate economic benefits and impact from oil and gas industry operations, it is the much larger set of benefits and multipliers from overall provision and use of competitively supplied and delivered fuels and materials that underlies economic value.** These returns swamp those of other energy technologies, for several reasons. Hydrocarbon fuels provide a **greater measure of energy density** than other resources and technologies (more work per unit measure of energy value). They are **more easily stored**. These attributes mean that hydrocarbons offer **environmental benefits** that are not usually accorded to these fuels and related technologies. To replace a unit of energy provided by oil and natural gas, alternative energy technologies (currently available) must be scaled **orders of magnitude above** the hydrocarbons base. While renewables do not deplete, there is no commercial storage option that facilitates large scale deployment, and options for offsetting intermittency of renewable and other alternative energy forms are costly and inadequate. This does not mean that investment in alternative energy

R&D should be stopped. However, it should be **reconsidered, and targeted and focused on basic materials science** that can solve these problems before alternative energy systems are scaled up with myriad unintended consequences.

Total industry employment growth **averaged six percent per year** from early 2000s until recently with recession and soft natural gas prices. **In many states with established oil and gas production businesses, economic conditions have been somewhat better than for the nation as a whole.** Employment and other economic benefits are derived not just from direct oil and gas industry activity but many indirect and ancillary activities as well. After many years of slack spending, R&D investments by industry (which provides nearly all R&D investment in oil and gas) surged, a reflection of the deep technology and human resource needs in the shale oil and gas plays, deepwater GOM, and other frontiers. **R&D spending is a vital component of competitiveness and generates a wealth of connected economic benefits.**

Competitively supplied and priced energy can provide enormous economic benefits. Natural gas and gas-fired electricity **have provided relief** from more expensive oil and oil products. From a household perspective, higher prices can suppress spending and investment but the degree to which this happens is contingent on overall economic activity and household wealth. **Households are more sensitive to higher energy prices during slack economic periods,** thus the concern about rising gasoline costs today. For the industrial sector, energy cost, on average, is a **small part** of the U.S. manufacturing base (a bigger component for feedstock industries). During the effort to produce the 2011 NPC study, *Prudent Development*, it was clear from industrial subcommittee deliberations that many other factors drive manufacturing activity. The subcommittee concluded that **industrial growth is more strongly linked to gross domestic product (GDP) than any other factor.** Other factors include energy cost, legislation and regulation (in particular, carbon policy which adds to operational cost and risk), technology, and other considerations such as international trade competitiveness and labor and health cost and policy. Informal conclusions reached by the subcommittee were the following.[2]

- Energy intensive basic industries are important to long term economic growth because they are the base materials used to produce all other products consumed in the U.S.
- Industry has proven itself an efficient user of natural gas, responding to high prices by investing in efficiency and shutting down assets which no longer compete.
- A robust supply of natural gas that is affordable and reliable would give the industrial sector, especially energy intensive industries, a global advantage creating investment and jobs in the United States.
- Action by federal and state policymakers will have a defining impact on whether the U.S. industrial sector continues to lose jobs or whether it will thrive over the next century.

[2] From draft documents prepared by the subcommittee, of which Dr. Michot Foss was a member.

- The industrial sector use of energy creates significant value for the country.

An industrial renaissance fueled by U.S. domestic resources is as contingent on larger macroeconomic and policy conditions as on isolated influences like energy prices.

An example lies in the trucking industry.[3] The disparity between oil and natural gas prices is spurring considerable effort to explore and invest in timely options for increasing utilization of natural gas as a transportation fuel. Regional and interstate trucking operations are a target because truck fuel distribution infrastructure can move more quickly than retail distribution for the overall U.S. light duty vehicle fleet. And yet the trucking industry is struggling with a sharp decline in employment, a recession effect but, more importantly, also a function of a longer term trend as **potential drivers exit or avoid the trucking industry**. Road infrastructure, regulatory compliance (ranging from safety to environment), cost of operation – an assortment of variables is affecting one of the most vital arteries for U.S. economic activity, and one that could benefit hugely from advances in domestic production.

3. Impacts on energy markets of regulatory and supply chain hurdles faced by energy exploration and production firms.

Regulatory and supply chain hurdles can emanate from many causes. Any can impact replenishment and deliverability by creating delays, increasing costs, blocking access. I highlight a few specific concerns below.

- **A specific challenge for midstream/downstream supply chain infrastructure is posed by unconventional plays because these challenge existing fairways and processing locations.**

As oil, natural gas, and NGLs production is established in new unconventional basins, the U.S. pipeline, storage, and processing network will need to adapt. Lags in offtake of NGLs could present a drag on liquids rich production areas. Indeed, NGLs prices have been falling the past several weeks as surplus conditions emerge, a result of inadequate "offtake". Natural gas, oil, and oil product pipelines need debottlenecking and new additions. Certifying and constructing new pipelines is increasingly difficult. A lesson on future tests emanated from the Keystone pipeline slated to carry Canadian oil sands, Bakken, and other crude oil to the Gulf Coast.

Midstream developers respond most assertively to "spreads" – price differences across regions and seasons. The strong WTI/Brent spread is triggering activity to debottleneck the midcontinent region. Unusually for natural gas, spreads are absent, exacerbated by soft demand from recession and a warm winter. This is not

[3] Information from Groendyke Transport as presented to the Natural Gas and Energy Association of Oklahoma, September 2011, and provided by EnerFin, a Houston-based midstream company.

likely to be a permanent condition. Significant investments in natural gas pipeline and storage capacity already had been made, but some of this capacity may be "stranded" by shifts in production and collapsed spreads that previously had supported projects (Rockies Express to the northeast being a prime example).

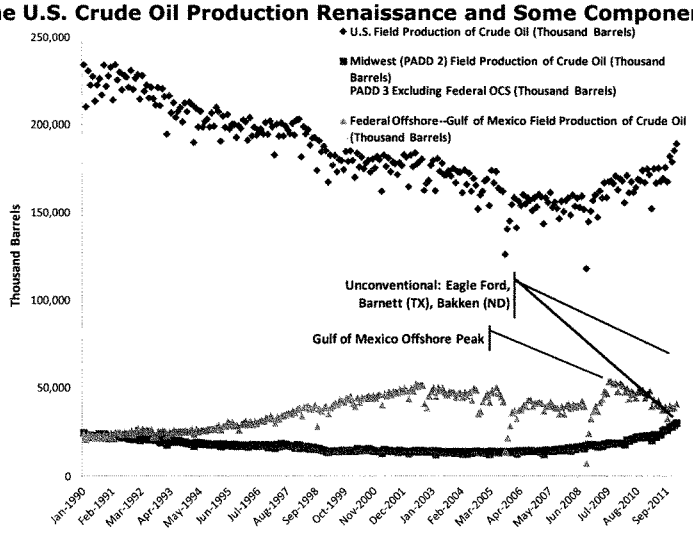
Downstream refining and petrochemical investment is under review. Some **$80 billion in new downstream spending** is anticipated for the Gulf Coast alone. Other regions and states are targeted to host additional capacity, especially in the swath of production areas from Marcellus west to the Bakken. **Timing, location, and ultimate extent of capital expenditure will hinge on many variables.** The refining industry currently is plagued by low profit margins, as high cost crude feedstock in some locations (northeast) accelerated beyond retail pricing. Soft demand, from both recession and a long term decline in gasoline consumption, undermine refining profitability, in general. Environmental risk and uncertainty complicate the picture. Expectations are that refiners and petrochemical operators will increase exports of their products if prevailing conditions continue into the future. Not much of these export volumes will reach other U.S. customers. **Review and reform of the Jones Act should be considered** to foster new, cost effective transportation routes in U.S. waters so that more Americans can benefit from our own competitively produced energy supplies.

In sum, **"debottlenecking" the oil and gas transportation and storage system requires transparent, sensible, and timely certification of facilities.** "Access" to right-of-way to build infrastructure is just as critical as access to oil and gas resources in order to sustain domestic industry and production competitiveness.

- **With regard to replenishment and deliverability, unconventional plays are helping to insulate against GOM issues, but GOM production must continue.**

Soft demand for oil products, a consequence of our deep recession, has helped to protect customers and consumers against potentially higher prices and disruptions related to Gulf of Mexico production decline. This decline has two major drivers. One – **maturity in older, shallow water fields** on the GOM shelf. Maturing and natural decline is affecting GOM natural gas deliverability much more heavily than oil. Oil production has benefitted from exploration success in oil-prone deepwater blocks. But, second – **uncertainty about policy and regulatory oversight** of the GOM Outer Continental Shelf (OCS) province is hindering investment, affecting replenishment and is, therefore, a potential factor in domestic oil reserve replenishment and supply deliverability going forward.

The U.S. Crude Oil Production Renaissance and Some Components



CEE-UT analysis based on U.S. EIA survey data.

- **Sustaining socioeconomic benefits will require a competitive tax and business environment.**

The debate on oil and gas industry taxation continues to unfold. For many, tax treatment of exploration cost and producing fields as they deplete seems unfair. However, replenishment is not simply critical, it is a matter of survivability. The oil and gas industry is **one of the most, if not the most, heavily taxed industries** in the U.S. when all jurisdictions – federal, state, local – are considered. In order to successfully operate through business and price cycles, navigate higher costs, continue funding and deployment of R&D and advanced technology, deal with workforce retention and recruitment, and, not least, guarantee safe and environmentally responsible operations, the industry needs a transparent and flexible fiscal regime that is consistent with fiscal policy across the economy.

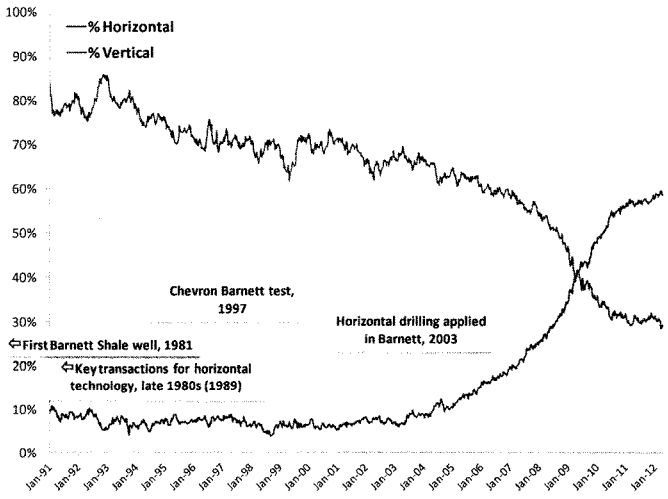
- **Sustaining socioeconomic benefits will require thoughtful and flexible environmental regulatory oversight.**

It is not easy to design and implement rules and regulations to ensure safe operations while also being cognizant of industry requirements and "cycle time" (time from origination of project concept to execution). **Reducing cycle time** helps with cost management. Public safety can be assured while also avoiding undue pressure on cycle time.

4. Role of and potential for technology advances in driving current and future energy production and impacting prices.

The biggest cost component in oil and gas supply is drilling. Consequently, drilling technology adaptation, especially in frontier applications, is **crucial to ensuring competitive supply and pricing**. For comparison, it has taken roughly 30 years for horizontal drilling to comprise more than 50 percent of the drilling market (see chart below). The oil and gas industry has one of the longest lead times for technology prove-up. Work is underway for solutions to specific problems in unconventional plays, most of which are geared toward improving recovery factors. New tools for predicting microfractures, new proppants for micro ("nano") environments, new approaches for water handling and disposal and even, perhaps, replacements for water as a drilling medium – all of these are in exciting stages of R&D. Continued investment in technology is best fostered through reasonable, coherent business and government frameworks.

Commercial Pathway for Horizontal Drilling in the U.S.



Based on Baker Hughes rig activity data.

Chairman HALL. Thank you very much. I must stay, you really answered all the questions, but I need a little more time with you on your chart sometime. Thank you, Dr. Foss.

I recognize Mr. James Brown now for your five minutes, or more.

STATEMENT OF MR. JAMES BROWN,
PRESIDENT AND CHIEF OPERATING OFFICER,
WHITING PETROLEUM CORPORATION

Mr. BROWN. Mr. Chairman, Ranking Member and Committee Members, thank you. It is a great honor and pleasure for me to be here this morning.

I am going to step out on a limb and just think that maybe many in the room haven't heard of Whiting Petroleum Company, so Whiting is a Denver-based E&P company. The company was founded in 1980. We have kind of endured the ups and downs of the E&P business during that time. Whiting became a publicly traded company in 2003, and through acquisitions doubled the size of the firm in 2004 and again in 2005. Those acquisitions provided three assets that today comprise approximately 70 percent of our 345 million barrels of oil equivalent proved reserves that we have in the company. Those assets are the Postle Field located in Texas County, Oklahoma, out in the panhandle near Guymon, the North Ward Estes Field located in the Permian Basin out near the big town of Monahans, and also several assets up in North Dakota that provided us the springboard to become the number three oil producer in that state. What has enabled Whiting to grow production from 33,000 BOE per day in 2005 to over 76,000 BOE per day in 2012 is new technology. Today in the Bakken, and I am going to say Bakken, and what I am referring to is the total Bakken hydrocarbon system which includes the Upper Bakken shale, all the Members of the Middle Bakken, the Lower Bakken shale and the Three Forks, and for those that are interested I brought samples of all those for you to look at today if you have any interest in doing that.

Whiting drills down 10,000 feet vertically, about 2 miles, turns and drills another 2 miles horizontally. We run 4–1/2-inch pipe in the well with up to 40 sliding sleeves and swell packers. The drilling rig is moved off. Production facilities are constructed. Frack ranks are moved in, filled with water. A pressure pumping company moves in and the wells are fracture stimulated with sand in 30 to 40 stages, depending on how many sliding sleeves we run. This entire fracture stimulation treatment is completed in around 24 hours. The pressure pumping company moves off location and the well is placed on production. Our goal is zero gas emissions from the well during flowback.

The gas produced with the Bakken oil must be processed before it can be sold. Whiting has constructed two gas plants in North Dakota with a combined processing capability of 120 million cubic feet per day. We process as much gas from other operators' wells as we do from Whiting wells. We have built two oil-gathering systems and we transport as much produced oil as we can from the basin via pipeline.

I am going to switch gears and move over to our two enhanced oil recovery projects. In Texas down in North Ward Estes, we are

utilizing CO_2 to recover an additional 15 to 20 percent of the oil in that mature reservoir. At North Ward, we are injecting 325 million cubic feet of CO_2 a day, managing 790 patterns containing over 2,000 wells. The CO_2 that comes back out of the producing wells is recycled, separated using a membrane technology, and reinjected. Approximately one-half of the CO_2 that we inject stays in the reservoir and will be permanently sequestered once that process ends.

Whiting recently executed a contract with the Texas Clean Energy Project to use CO_2 from their coal gasification plant in our North Ward Estes field.

Much of what I just discussed would not have been possible even five years ago. Unconventional resource plays and technology have impacted every facet of our business from consummating the lease to drilling the well to reporting production. We routinely drill a 20,000-foot horizontal well in 15 to 20 days. We use technology to send information being recorded at the drill bit to the surface in real time that our engineers and geologists in Denver can access at their desktop.

Sliding sleeve technology continues to improve. Whiting was the first company to pump a 24- and 40-stage sliding sleeve frack job.

We have constructed a rock lab in Denver where we have two scanning electron microscopes to help us understand how oil is produced from these unconventional reservoirs. Our goal is to transfer this knowledge from the Williston Basin to other basins across the lower 48. We are actively working in the DJ Basin in Colorado and the Delaware Basin in West Texas where recent results have been very encouraging. We believe there is potential to utilize what we have learned in several other prospects.

How does this translate into jobs? When Whiting went public in 2003, we had 110 employees. As of April 1, 2012, Whiting employed 746 individuals. We currently have 271 open positions in the company. Currently, we have 19 drilling rigs in operation in North Dakota. If you take the number of people directly employed by the drilling company, add up all the individuals that provide service and the vendors required to drill a well, that amounts to 600 indirect jobs that we have created in North Dakota. These people need homes, food, schools, and other services. The economic impact of what we are doing is far reaching.

As we have already heard this morning, the price of gasoline at the pump is getting a lot of attention. It seems that all oil companies get lumped together and get blamed for this oil price. I just want to say in this regard, Whiting is similar to the local farmer. We are price takers. Whiting tries to protect our cash flow utilizing hedges and commodity markets but we have little influence over the overall oil price. To impose legislation that would make it more expensive to produce oil makes no sense.

Along those lines, the Keystone XL pipeline was scheduled to transport around 200,000 barrels of oil per day out of North Dakota to markets. This would be very beneficial and help alleviate the price differentials that we experience in North Dakota. It would improve the net backs and increase royalties paid to the Federal Government, the State of North Dakota and the individual mineral interest owners.

I thank you for the opportunity to present to you today.
[The prepared statement of Mr. Brown follows:]

Testimony of

JAMES T. BROWN

PRESIDENT AND CHIEF OPERATING OFFICER

WHITING PETROLEUM CORPORATION

before the

COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY

UNITED STATES HOUSE OF REPRESENTATIVES

April 17, 2012

Whiting Petroleum Corporation is a Denver based, New York Stock Exchange traded exploration and production (E&P) company. Whiting was founded in 1980 and has endured the ups and downs of the E&P business since that time. Whiting became a publicly traded company in 2003 and through acquisitions doubled the size of the firm in 2004 and again in 2005. Those acquisitions provided three assets that today comprise over 70% of our 345 million barrels of oil equivalent (BOE) reserves. Those assets are the Postle Field, located in Texas County, Oklahoma; the North Ward Estes Field located in Ward and Winkler Counties, Texas; and several properties in the Williston Basin of North Dakota that provided Whiting with the toehold that has allowed us to become the number three oil producer in that state.

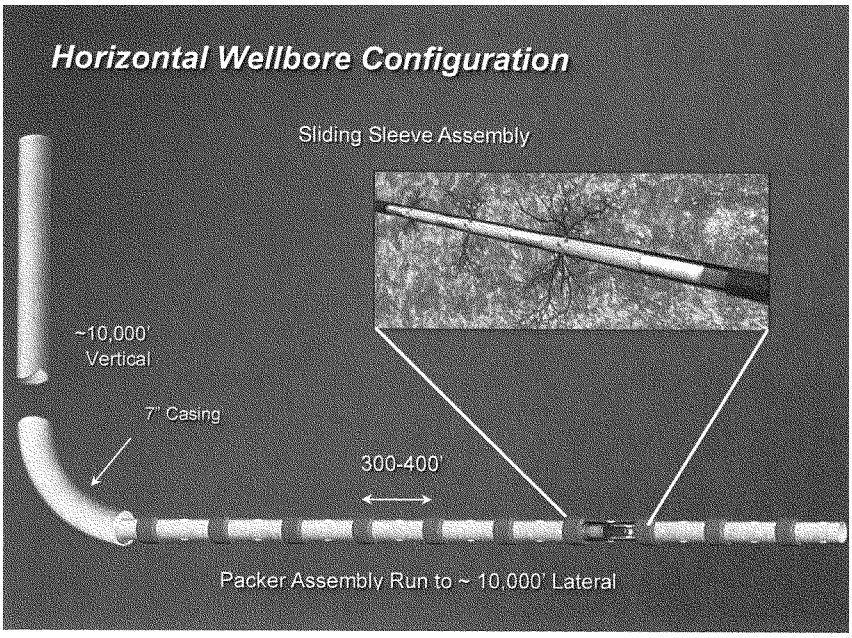
What sets Whiting apart from many of our peers is we are an oil company. Based on either production or reserves we are approximately 83% oil. In January of 2012 our net production was just over 76,000 BOE per day. What has enabled Whiting to grow production from 33,100 BOE per day in 2005 to over 76,000 BOE per day in 2012 is technology. Drilling horizontal Bakken wells in North Dakota is not a new concept. In the late 1980's and early 90's several operators were drilling horizontal wells in the Bakken shale. However, they were relying totally on Mother Nature to provide the fracturing. Sometimes she provided it, sometimes she did not.

That activity was followed by a round of drilling in 2000 through 2005 in the Elm Coulee Field in Richland County, Montana. In this round of drilling, horizontal wells were drilled not in the Bakken Shale, but in a dolomitic section in what was identified as the Middle Bakken. These 4,000 to 7,000 foot laterals were fracture stimulated with one big frac job. This effort was very successful and was responsible for the big production increase that occurred in Montana during the early part of this century.

Whiting did not have a very material lease position in the Montana Bakken, so we tasked our technical staff to look other places in the Williston Basin and in other basins where we might repeat what had occurred in the Elm Coulee field. We had learned that we probably did not

want to drill in the shale, we needed a poor grade reservoir rock to provide the conduit for the oil to get from the shale to the horizontal wellbore. Staff identified an area on the Eastern side of the Williston Basin in a very lightly drilled area in Mountrail County, North Dakota. Whiting leased around 100,000 acres and drilled several wells utilizing the same technology that had been employed in Montana and the results were not very encouraging. Other operators were also attempting to get the Bakken to produce in North Dakota and they were also having mixed results.

In August of 2007 Whiting drilled a well named the Locken 11-22H. This well was drilled across two sections, two square miles, with a lateral length of approximately 10,000 feet. A new Frac Point® technology being developed by Baker Hughes was utilized where we ran 10 swell packers on the outside of the 4-1/2" diameter pipe that was installed in the horizontal portion of the well. When swell packers come in contact with hydrocarbons, they adsorb the hydrocarbon, swell, and create a seal between the pipe and the rock walls of the borehole. This segregates the horizontal wellbore into 10 separate sections. In between each set of swell packers is a sliding sleeve that is opened by dropping successively larger ceramic balls to activate the sleeves. This allows the horizontal wellbore to be hydraulically fracture stimulated 10 times, rather than just a single time as earlier technology allowed. This technology was a game changer. The Locken had an initial production rate over 1600 BOE per day.



Today, in the Bakken, Whiting drills down 10,000' vertically, close to two miles, turns and drills a 6-1/4" diameter hole horizontally for another two miles. We run 4-1/2" pipe in the well. Sliding sleeve technology has advanced and now allows us to run up to 40 sliding sleeves and swell packers. The drilling rig is moved off, production facilities are constructed, frac tanks are moved on location and filled with up to 50,000 barrels (2.1 million gallons) of water. A pressure pumping company is moved on location and the wells are frac'd with up to 2 million pounds of sand in 40+/- individual frac stages. This entire fracture stimulation treatment is completed in around 24 hours. The pressure pumping company is moved off location and the well is placed on production.

Our goal is to have zero gas emissions from the well during flowback. The associated gas produced with the Bakken oil must be processed before it can be sold. The gas has a high BTU

content in its native state. Whiting has constructed two gas plants in North Dakota; one in Mountrail County and a second in Stark County to process this gas. Liquids are removed from the gas and we sell the residue into the local market. We are processing as much gas from other operator's wells as we are from the wells Whiting has drilled. We have built two oil gathering systems and we are transporting as much of the produced oil as possible from the basin via pipeline.

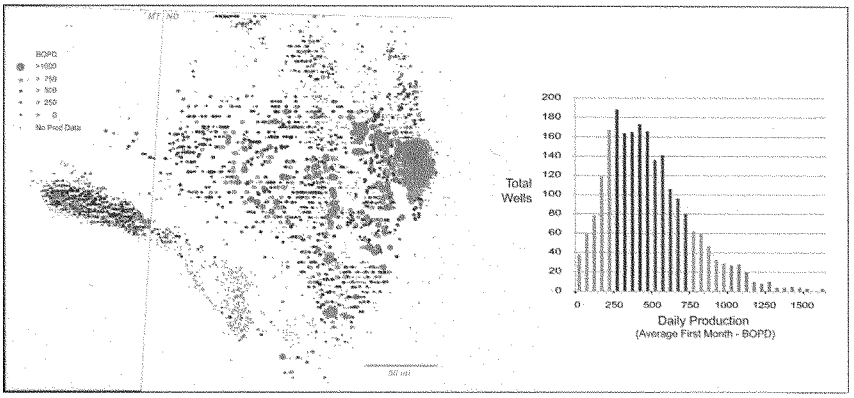
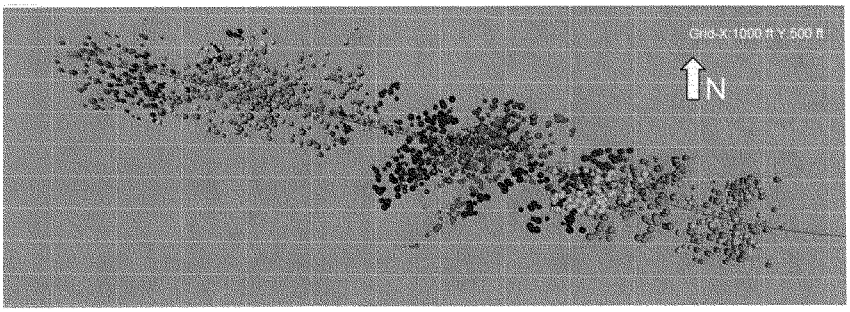


Figure #1 Initial producing rates for Bakken and Three Forks wells based on the average of the first 30 days of production

Development of the Bakken is proceeding at a rapid rate with 216 drilling rigs and over 4000 wells drilled to date. Current production is 680 MBOPD which represents approximately 4% of the current U.S. demand. To date, the Bakken has produced .73 billion barrels with publically disclosed estimates of ultimate production ranging between 8 to 24 billion barrels. We currently believe that the Bakken in North Dakota and Montana is ultimately capable of yielding a total of 9 billion barrels within current product pricing, regulatory constraints and existing technology.

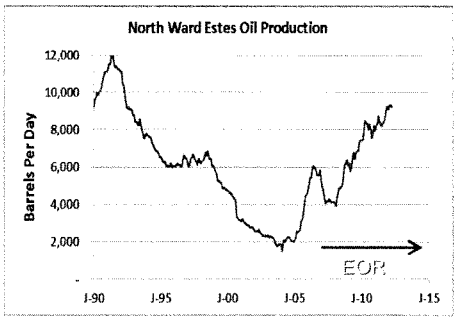
If the frac job is performed in Sanish Field, a micro-seismic survey of the frac is recorded to determine what portion of the reservoir was frac'd. In March of 2010 Whiting completed the

installation of 298 permanent seismic monitors across the Sanish field. This installation allows us to record data and map the fracture stimulations to determine the rock volume contacted with the frac job.



The above is an example of the data that is generated from a micro-seismic survey. This is a map view of the fracture stimulation treatment. The red line represents the horizontal wellbore. The heel, or the portion of the horizontal closest to the vertical well is on the right and the toe, or end of the horizontal is on the left. The different color dots represent the different stages of the frac job. This particular example was a 24 stage fracture treatment. The fracture extends about 750 feet either side of the horizontal wellbore, and it appears we did a pretty effective job contacting the reservoir.

Moving on to our Enhanced Oil Recovery projects at the North Ward Estes field in Texas and the Postle field in Oklahoma. We are utilizing CO_2 to recover an additional 15-20% of the oil in these reservoirs. At North Ward Estes we are injecting 325 million cubic feet per day of CO_2 managing 790 patterns containing over 2,000 wells. In total, these projects produce over 18,000 barrels of oil per day, which is approximately 24% of Whiting's total daily production. As a result of CO_2-EOR, production has increased significantly at both fields. The following chart illustrates the production increase at North Ward Estes.



The increasing production will extend the life of these fields which will provide high quality jobs for many years to come; a significant benefit to the local communities and beyond.

Since the inception of CO_2-EOR in the early 70's, the technology for implementation and management of these projects has evolved dramatically. Specialized procedures utilizing CO_2 resistant cements are used to seal and complete wells ready for production. Specialized metallurgies are utilized to prevent corrosion as a result of the acids created by mixing water and CO_2. Advanced reservoir characterization techniques are used to visualize the rock strata and design flood patterns. Sophisticated computer monitoring is used to manage the movement of CO_2 within the reservoir. Operations are controlled via state-of-the-art Supervisory Control and Data Acquisition systems (SCADA).

Implementing CO_2-EOR projects requires significant volumes of CO_2. The CO_2 is injected into the reservoir containing the oil. The injected CO_2 is absorbed into the oil, which reduces the viscosity and allows the oil trapped in tiny pore throats of the rock to flow. Alternating slugs of water are used to push the mobile oil to adjacent wells where it is produced and recovered.

The majority of CO_2 used for Enhanced Oil Recovery operations originates from five naturally occurring sources of CO_2 located in Colorado, New Mexico and Wyoming. Other sources of CO_2 include anthropogenic or manmade sources which are typically plants such as ethanol or coal

gasification facilities. The CO_2 produced from these sources is transported to various CO_2-EOR projects via a network of pipelines.

Currently the supply of CO_2 for EOR is tight with the majority of sources producing at record levels. The lack of supply is an impediment for widespread implementation of CO_2-EOR. Efforts to expand naturally occurring sources of CO_2 are ongoing. A number of manmade sources or plants are also under development. Plants or manmade sources can be an important source of CO_2 for the future.

The Texas Clean Energy Project is an anthropogenic source currently planned for West Texas. The project will gasify coal from Wyoming and generate electric power. Whiting is committed to take a significant portion of the CO_2 output from the plant. The CO_2 will be injected into Whiting's North Ward Estes field for EOR operations and permanently sequestered once EOR operations cease. Not only will the project enable expanded use of EOR, it will also lead to increased use of abundant, affordable U.S. coal. In addition to electric power, projects like these can generate high value transportation fuels, such as diesel and gasoline which can ultimately reduce U.S. dependence on foreign sources for these fuels.

An important aspect of CO_2-EOR is the permanent sequestration of large volumes of CO_2. The technology for measuring and monitoring the injection of CO_2 into the subsurface has improved significantly. Today, seismic is used to create 3D images of the subsurface. Down hole logging technology is used to monitor fluid flow within the reservoir. Computers control alternating cycles of water and CO_2 injection which are used to control how the oil is swept from injector to producer. Continuous monitoring of down hole pressure ensures optimal conditions for flood performance throughout the process. While CO_2 is recycled several times from injector to producer, once CO_2-EOR operations cease, all CO_2 remains permanently sequestered.

There is significant potential for expanded use of Enhanced Oil Recovery using CO_2 within the United States. The DOE estimates that as much as 89 billion barrels of additional oil could be

recovered with widespread implementation of the technology. Realizing this potential, however, will be challenging. In addition to securing further supplies of CO_2, new pipelines will need to be built and numerous aging oil fields will need to be rehabilitated.

Much of what I have discussed would not have been possible even five years ago. Unconventional resource plays and technology have impacted every facet of our business from consummating the lease to reporting production. Because of the size of the resource plays we have gone from leasing portions of townships to leasing counties. To assist with this effort we have digitized lease records for entire counties. We routinely drill a 20,000' horizontal well in 15 to 20 days. We utilize technology to send information being recorded at the bit to the surface in real time. The engineers and geologists in Denver can access this information at their desk. Sliding sleeve technology has continued to advance. Whiting was the first company to pump a 24 and 40 stage frac utilizing sliding sleeves.

If asked to identify the one part of our business has made the most dramatic change it would be in the equipment used to drill the well. The drilling rig of today bears little resemblance to the drilling rigs of 15 years ago. There are top drives, iron roughnecks, and automated catwalks. The Driller, the person who operates the rig, now sits at a "Star Wars" looking console all of the controls are electronic. He gathers information needed to run the rig from a number of strategically located flat panel screens. There is no roar of diesel engines just the quiet whine of electric motors. There is now an electrician / instrument technician as part of the crew to help keep all of these electronics functioning in what can become a hostile weather environment. Today's rigs have mud pumps with increased horsepower over what was on older rigs to power the new high torque mud motors. That, in combination with new bit technology, has allowed us to drill an entire 10,000' horizontal well with a single bit run. The end result is drilling the well much faster in a safer environment for the employees.

We have a rock lab located in our Denver office where we have two scanning electron microscopes (SEM) to help us understand how oil is produced from these unconventional

reservoirs. The resolution with these microscopes is about a nanometer, about the size of a methane molecule. The Helios Nanolab 650 SEM allows us to create a 3D visualization of a cube of the reservoir rock. With this 3D visualization we can examine the size and shape of the pore throats in the rock. What we have learned is although natural gas will flow through shale, i.e. the Barnett, oil molecules are too large to fit through the pore throats. We need to find a pseudo reservoir located in proximity to the shale to allow oil to be produced. Our goal is to transfer what we have learned in North Dakota to other basins. We are actively working in the DJ Basin in Colorado and the Delaware Basin in West Texas. In each of these areas our results are encouraging. We believe there is potential to utilize what we know in several other prospects located in other Lower 48 basins.

How does this translate into jobs? When Whiting went public in 2003 we had 110 employees. As of April 1, 2012 Whiting employed 746 individuals. Across Whiting's operations we have over 250 open positions. Currently we have 19 drilling rigs in operation in North Dakota. A drilling rig employees approximately 25 individuals. A frac crew employees approximately 65 individuals and we have two full time frac crews employed. There are approximately 40 vendors involved in the drilling of a well. If each vendor had only one employee that would be another 40 jobs. Add all of this up and it approaches 600 indirect jobs created by our activity. These people need a place to live, they need food, and schools and hospitals and other services. The impact of our efforts on the economy is far reaching.

We are fortunate that the Bakken exists in North Dakota. Much of the surface and mineral ownership in North Dakota is by individuals with a minor Federal and State ownership. Obtaining permits in North Dakota is a reasonable process. The one area we are having difficulty is in Stark County, North Dakota near Theodore Roosevelt National Park where there is Federal ownership (the park is off limits) and Federal drilling permits are required. The average time to receive an approved Federal drilling permit is currently 298 days.

One of the topics getting its fair share of attention these days is the price of gasoline at the pump. Oil companies get lumped together and get blamed for the price of gas. In this regard, Whiting is similar to the farmer, we are price takers. We try to protect our cash flow utilizing hedges and the commodity markets but we have little influence on the overall oil price. To impose legislation that would make it more expensive to produce oil would make no sense.

Along those lines, the Keystone XL pipeline was (or is) scheduled to transport around 200,000 barrels per day of North Dakota production to the refining markets. This would be very beneficial and help alleviate the high price differentials that have been experienced in North Dakota. This would improve the net backs and increase the royalties paid to the Federal Government, the State of North Dakota and the mineral interest owner.

The three dominant factors in determining economic viability of any product are capital investment in drilling, well productivity and product price. While we have minimal control over product pricing, we believe that a combination of stable regulatory environment and continued increase in technologies that help us to increase well productivity and reduce our costs will allow energy companies to increase the ultimate recovery from the Bakken by as much as 60% (9 Billion barrels to 15 billion barrels).

Whiting strives to be a good steward of our assets for our shareholders, for the state and governmental areas where we operate, and for the mineral interest owners who have allowed us to develop their resource. We strive to be good stewards of the environment to preserve the environmental resource for future generations.

Chairman HALL. I thank you. Mr. Brown.

Now the Chair recognizes our last witness, Dr. Daniel Weiss, for five minutes, and thank you, sir.

STATEMENT OF MR. DANIEL WEISS
SENIOR FELLOW AND DIRECTOR OF CLIMATE STRATEGY, CENTER FOR AMERICAN PROGRESS ACTION FUND

Mr. WEISS. Thank you, Mr. Chairman. Chairman Hall, Ranking Member Johnson and Members of the Committee, thank you very much for the opportunity to testify today. I am Daniel J. Weiss, a Senior Fellow at the Center for American Progress Action.

High oil prices are responsible for high gasoline prices. The Energy Information Administration estimates that 72 percent of the cost of a gallon of gas was due to the cost of crude oil. As Mr. Brown just noted, oil prices are set on the global market, which is controlled by the Organization of Petroleum Exporting Countries, a cartel. The Federal Trade Commission found that "OPEC attempts to maintain the price of oil by limiting output and assigning quotas."

Canada, which produces most of its own oil, also has high gasoline prices right now. On March 30th, the Edmonton Journal reported that "Canadians are paying some of the highest prices they ever have for gasoline."

The President has little control over oil prices, as recently noted by the Wall Street Journal, the Cato Institute and a survey of economists by the University of Chicago. Gasoline prices are up 84 cents per gallon since Representative Boehner became Speaker in January 2011, yet is he to blame for the recent high gasoline prices?

The increase in shale oil production in places such as the Bakken shale in North Dakota and Eagle Ford in Texas is due to advances in horizontal drilling and hydraulic fracking developed with the assistance of federal research, as Mr. Slaughter noted.

As you can see on this slide [oil production v. gas prices], more oil production cannot lower gasoline prices. The Associated Press study of oil production and gasoline price data from three decades determined that there was "no statistical correlation between how much oil comes out of U.S. wells and the price at the pump." The red line is gasoline prices. The blue line is U.S. oil production. And as you can see, even as oil production has increased on the right-hand side of the slide, gasoline prices have increased even more dramatically.

Fortunately, we are using less oil due to modern vehicle fuel economy standards adopted by President Obama in 2009. By 2025, the average car will go twice as far on a gallon of gas compared to 2010. This will save 2 million barrels of oil per day and save $8,000 in gasoline costs compared to a 2010 vehicle.

We are also producing more of our own oil. The Energy Information Administration determined that in 2011, the United States generated 3.7 quadrillion BTUs of energy from crude oil produced from federal lands and waters compared to 3.3 quadrillion BTUs in 2008, a 12 percent increase in production from federal lands and waters compared to 2008.

Continued dependence on a product where we consume 20 percent of the annual supply but have only two percent of its resources will leave us vulnerable to oil and gasoline price spikes. As Ms. Johnson noted in her opening statement, the most effective way to reduce pain at the pump is to reduce our oil use so we pump less. We must invest in alternatives to oil. Plug-in hybrids and all-electric vehicles consume little or no gasoline. During their first year, the combined sales of the plug-in hybrid Chevrolet Volt and all-electric Nissan Leaf were twice as large as the now-familiar Toyota Prius and Honda Insight hybrids during their first year. In March, Chevrolet sold more Volts than in any previous month.

Investments in buses, subways and trains can also reduce our dependence on oil and create jobs. Public transportation saves 4.2 billion gallons of gasoline annually. Every $1 billion invested in public transportation supports 36,000 jobs.

The House-passed fiscal year 2013 budget resolution authored by Representative Paul Ryan would worsen pain at the pump by slashing billions of dollars of investments in transit, alternative fuels and clean energy technologies that will reduce oil consumption. Instead, the budget would retain $40 billion in tax breaks for big oil companies.

We must also reduce Wall Street speculators' ability to drive up prices. Many experts believe that these speculators are driving up oil prices to make a quick profit preying on the fears of a supply disruption. The reports of President Obama's new plan to be announced today to fight Wall Street speculators would reduce their ability to drive up prices and would put more cops on the beat policing oil trades.

One so-called solution won't reduce gasoline prices. The State Department determined that, and I quote—this is from their analysis of the Keystone pipeline—"Building Keystone XL would not of itself have any significant impact on U.S. total crude runs, total crude and product import levels, or costs."

Mr. Slaughter in his work with the National Petroleum Council has put together essential recommendations that would help protect public health as we develop our shale oil and natural gas resources. This means avoiding, and I quote from the NPC study "air and water pollution that directly affects public health as well as these and other impacts affecting habitat, fisheries and the global climate."

Lastly, I would also note that the NPC also strongly advocates "a mechanism for putting a price on greenhouse gas emissions that is economy-wide."

Thanks very much for the opportunity to testify and I would be happy to answer any questions.

[The prepared statement of Mr. Weiss follows:]

Center for American Progress Action Fund

Daniel J. Weiss
Senior Fellow
Center for American Progress Action Fund

Testimony on
"Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology and Policy Pathways"

House Committee on Science, Space, and Technology
2321 Rayburn House Office Building
April 17, 2012

Chairman Hall, Ranking Member Johnson, and members of the committee, thank you very much for the opportunity to testify today on "Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology and Policy Pathways."

My name is Daniel J. Weiss. I am a Senior Fellow at the Center for American Progress Action Fund, a tax-exempt organization dedicated to improving the lives of Americans by transforming progressive values and ideas into policy.

In my testimony, I will address the impacts that new technologies and the expansion of domestic oil supply may have on oil and gas markets in the near-term; some of the factors that determine the price of gasoline at the pump; policy and technology pathways that may lessen the impact of high energy prices on consumers; and the ways environmental and workforce safeguards have impacted domestic oil production and prices in recent years.

I will also address some valuable recommendations by the National Petroleum Council in its report, "Prudent Development: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources."

The impact of new technologies on oil supply and prices

Oil price set on a global market

The most important contributor to high gasoline prices is high oil prices. The Energy Information Administration estimates that the cost of crude oil was 72 percent of the cost of a gallon of gas in February 2012. The price for a barrel of West Texas Intermediate crude oil was 3 percent higher in March 2012 compared to March 2011. Brent crude oil—a lighter, sweeter oil sold in Europe but often used to produce gasoline on the East Coast—was 9 percent higher compared to a year ago.

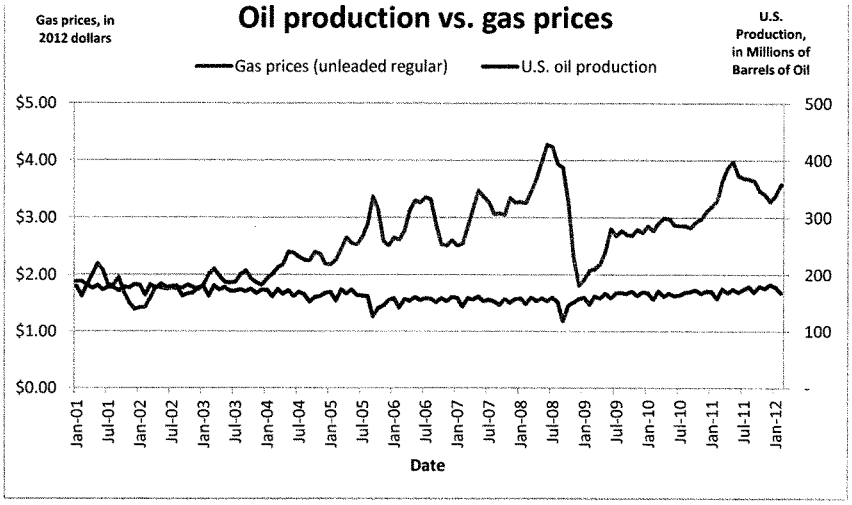
Oil prices are set on the global market, which is controlled by the Organization of Petroleum Exporting Countries, a cartel. The Federal Trade Commission found that:

> "Over 70% of the world's proven oil reserves are in Organization of Petroleum Exporting Countries (OPEC) member countries. OPEC attempts to maintain the price of oil by limiting output and assigning quotas. These actions by OPEC would be a criminal price fixing violation of the U.S. antitrust laws if done by private firms."

This leaves us extremely vulnerable to volatile prices or international events beyond our control.

AP study determined that expanded domestic production would have no impact on gasoline prices

Whenever oil and gasoline price spikes occur, Big Oil and its political allies revive their demand for "drill, baby, drill." But because oil prices are set by this world market, more domestic drilling cannot alter the world price.



To test whether more U.S. drilling would lower gasoline prices, the Associated Press completed an exhaustive analysis of 36 years of monthly U.S. oil production and gasoline price data. AP found that there is:

> "No statistical correlation between how much oil comes out of U.S. wells and the price at the pump. If more domestic oil drilling worked as politicians say, you'd now be paying about $2 a gallon for gasoline. Instead, you're paying the highest prices ever for March."

The United States is saving and producing more oil yet gasoline prices are high.

High oil and gasoline prices exact a real economic toll on American families and businesses. In 2011 Americans paid an average of $3.53 for a gallon of gas, and the high prices continue this year. Gasoline averaged $3.94 per gallon through the week of April 9. This is a 63-cent increase—a 19 percent bump—since January 2. Average weekly gasoline purchases this year are 4 percent lower than they were a year ago, yet families still spent $5.5 million more on gasoline the week ending April 9 than they did the week ending January 2.

The recent spike in oil and gasoline prices is not a first-time event. Fortunately, we are now better prepared to withstand its impact because we are using less oil. Gasoline demand is the second-lowest since 1997, due to modern vehicle fuel economy standards adopted by President Barack Obama in 2009—the first increase in more than 20 years. By 2016 the average car will use one-third less gasoline per mile compared to cars in 2010. The second round of standards will double fuel economy to 54.5 miles per gallon in 2025 compared to 2010. This will reduce

oil consumption by 2 million barrels per day. The typical owner of a 2025 model car will spend $8,000 less on gasoline compared to an owner of a 2010 vehicle.

We are also producing more of our own oil. For the first time since President Clinton, the United States is producing a majority of the oil we rely on to power our vehicles and economy. We are less reliant on other nations for oil and send less of our treasure abroad. *The New York Times* reported in March that, "In 2011, the country imported just 45 percent of the liquid fuels it used, down from a record high of 60 percent in 2005."

The Energy Information Administration determined that in 2011 the United States generated 3.7 quadrillion Btus of energy from crude oil produced from federal lands and waters compared to 3.3 quadrillion Btus in 2008—a 12 percent increase in production. And 2011 production from federal areas was higher than it was from 2006 through 2008 during the George W. Bush administration. What's more, the oil rigs in federal waters met significantly more protective worker and environmental-safety standards than before the BP oil disaster in 2010.

A March 20, 2012, Congressional Research Service report reiterated the increase in oil production on federal lands under President Obama:

> "On federal lands, there was also an increase in production from 2008-2009 and another increase in 2010 (258,000 b/d [barrels per day]), then a decline in 2011. Overall, oil production on federal lands is up slightly in 2011 when compared to 2007."

Similarly, the Columbia Journalism Review on March 22 reported that,

> "The average productivity on federal land and waters during the four Bush years, 2003-2008, was 634 million barrels per year. During the three Obama years, 2009-2011, it was 676 million barrels."

In other words, average annual oil production from federal lands and waters was 5 percent higher under President Obama than it was under President Bush.

The increase in oil production—due horizontal drilling and hydraulic fracking in places such as the Bakken Shale in North Dakota and Eagle Ford in Texas—benefit our security and economy. Producing more and using less oil reduces foreign oil imports and our trade deficit, creates jobs, saves families money on gasoline bills, and boosts economic growth by spending more oil dollars at home. But the Associated Press study of 36 years of oil production and gasoline price data determined that there is "No statistical correlation between how much oil comes out of U.S. wells and the price at the pump."

More domestic production from these new shale oil plays will not lower oil prices because prices are set on the world market. As long as oil prices remain high, so will gasoline prices.

The cause of high oil and gas prices

Presidents have little impact on gasoline prices

Because of this global, cartel-controlled market, the president of the United States has little control over oil prices. A March 10 *Wall Street Journal* article noted that,

"U.S. gasoline prices, like prices throughout the advanced economies, are determined by global market forces. It is hard to see how Mr. Obama's policies can be blamed." The NPC noted that an essential element of protecting public health and the environment is ensuring that federal and state agencies overseeing shale oil and gas fracking have the resources necessary to enforce the law.

> *Regulators at the federal and state level should have sufficient funding to ensure adequate personnel, training, technical expertise, and effective enforcement.*

The Cato Institute, a free-market think tank, came to a similar conclusion in early March:

> "Is President Obama responsible for the spiraling price of gasoline? Republicans say yes, but the facts say no. … Why have gasoline prices increased since the start of the year? The simplest explanation is that the price of crude oil has increased."

Worldwide trends don't suggest high oil prices

Domestic oil production is high, and demand is low. Yet oil and gasoline prices are high. We know that oil markets don't follow normal supply-and-demand rules partly because there are few substitutes for oil, and also because its price is set by the OPEC cartel. We also know that there are other factors that contribute to oil prices in a world market such as concerns about potential supply disruptions due to natural disasters or political turmoil in the Persian Gulf. But even when we take all the normal factors into account, it doesn't add up.

Worldwide trends don't offer much of a clue, either. The Energy Information Administration reports that worldwide consumption in the first quarter of 2012 is essentially unchanged from the fourth quarter of 2011, though it is about 1 percent higher than a year ago. Yet the April 10 price of West Texas Intermediate crude oil—sold in the United States—was $101 per barrel. Brent oil on the European market was $120 per barrel—or 5 percent higher than last year.

There have been some relatively minor supply disruptions in Syria, South Sudan, and Yemen, according to a February 2012 report by the Energy Information Administration. Libyan production is also at 81 percent of its pre-civil war capacity. And Saudi Arabia—the world's largest oil producer—has raised its output by about 600,000 more barrels per day than in 2011. Despite great tensions with Iran over its nuclear weapons program, there has not yet been a supply disruption in the Persian Gulf.

Canada is seeing inexplicably high gasoline prices too. *The Edmonton Journal* on March 30 reported that,

> "Canadians are paying some of the highest prices they ever have for gasoline, even though the amount that fuel makers pay for the crude oil that goes into making it has been in decline for months. ... Data from Statistics Canada on Thursday showed the price processors pay for crude oil fell 2.4 per cent in February from January, but the cost of gasoline from refiners rose 3.9 per cent. It was third straight month crude oil prices have declined and second straight month gasoline prices have increased."

Wall Street speculators are driving up world oil prices

On February 14 Bloomberg Businessweek noted that "rising gas prices: not demand driven." It cited Tom Kloza, chief oil analyst for the Oil Price Information Service, who says that speculators are helping to increase oil prices, and, in turn, gas prices:

> "Much of the increase [in oil prices] is due to speculative money that's flowed into gasoline futures contracts since the beginning of the year, mostly from hedge funds and large money managers. 'We've seen about $11 billion of speculative money come in on the long side of gas futures,' [Kloza] says. 'Each of the last three weeks we've seen a record net-long position being taken.'"

Further, a February 21 analysis of oil trades by McClatchy Newspapers concluded that Wall Street speculators are "behind sharply rising oil and gas prices." It determined that,

> "While tension over Iran has ratcheted up over the last few months, the price of oil and gasoline has leaped far beyond conventional supply and demand variables. Financial speculators are piling into the market, torqueing the Iranian fear factor into ever-higher prices.
>
> "Historically, financial speculators accounted for about 30 percent of oil trading in commodity markets, while producers and end users made up about 70 percent. Today it's almost the reverse.
>
> "A McClatchy review of the latest Commitment of Traders report from the Commodity Futures Trading Commission, which regulates oil trading, shows that producers and merchants made up just 36 percent of all contracts traded in the week ending Feb. 14. That same week, open interest, or the total outstanding oil contracts for next-month delivery of 1,000 barrels of oil (about 42,000 gallons), stood near an all-time high above 1.486 million. Speculators who'll never take delivery of oil made up 64 percent of the market."

Wall Street speculators' role in driving up prices in 2012 is consistent with evaluations of previous price spikes. Commodity Futures Trading Commissioner Bart Chilton recently cited numerous independent studies that indicate excessive Wall Street speculations played a significant role in earlier events. He also noted that nearly all of these speculators' trades are betting on higher, not lower, oil prices. Chilton recently said that, "CFTC data says that massive passive long speculators have shorts outnumbered 12 to one."

On March 5 *The Washington Post* reached a similar conclusion about speculation in current and previous oil price shocks:

> "Many analysts agree that trading activity is pushing up oil prices over and above what supply and demand would normally dictate — and much of this has been driven by fear over a possible conflict with Iran.
>
> "'Speculation has inflated oil prices by more than 30%,' says Fadel Gheit, an oil analyst at Oppenheimer & Co. That's in line with other estimates: A recent paper (pdf) by the Federal Reserve Bank of St. Louis found that 'financial speculative demand shocks' were responsible for at least 15 percent of the huge run-up in oil prices between 2004 and 2008."

Even oil executives understand that Wall Street speculation drives up oil prices. At a hearing before the Senate Finance Committee on May 12, 2011, Sen. Maria Cantwell (D-WA) asked ExxonMobil CEO Rex Tillerson, "What do you think the price would be today, if it was based on fundamentals of just supply and demand?" He responded: "It's going to be somewhere in the $60 to $70 range."

In fact, at the time of the hearing WTI crude oil was selling for $98 per barrel—40 percent to 63 percent more than Tillerson's predicted range.

To decrease the impact of Wall Street speculators on oil and gasoline prices, the Commodity Futures Trading Commission must use the tools at its disposal to crack down on them. It must use its authority to set "position limits" to restrict the amount of oil Wall Street speculators can control in the market. In addition, Congress must ensure that the commission has the money needed to put enough cops on the beat to enforce the law. Those who would cut commission funding are in effect helping Wall Street speculators drive up oil and gasoline prices.

Are oil companies rigging gasoline prices?

How can this discrepancy be explained? Even some leading oil experts express bewilderment about high oil prices. Reuters just reported that oil specialists found that high oil prices are inconsistent with current levels of supply and demand:

> "'The reality today is that the market is well oversupplied. OPEC production has been rising consistently since September and will probably continue rising further,' said Colin Smith, energy strategist at VTB Capital."

Similarly, on April 2 *The Wall Street Journal* determined that,

> "There is no shortage of crude oil in the global markets and current prices aren't justified by demand-supply fundamentals, Qatar's energy and industry minister said Monday, easing concerns over supply constraints.

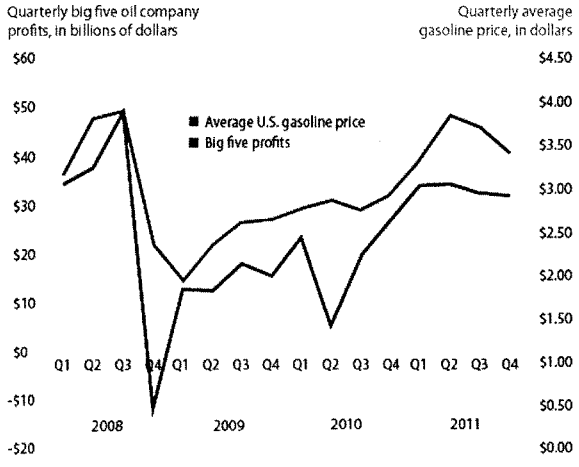
> "'Oil producers are committed to supplying. When you look at demand-supply, there is no evidence of a shortage of oil anywhere in the world,' Mohammed Bin Saleh Al Sada told reporters. 'When it comes to price … there are so many elements—not necessarily part of fundamentals of supply and demand—but other factors.'"

Many Americans believe Big Oil companies are responsible for these "other factors" and suspect these giant corporations have rigged gasoline prices in their favor. Could they be on to something?

Certainly oil companies have an incentive to support high gasoline prices. A March 1, 2012, report by the Congressional Research Service determined that higher gasoline costs "yield a windfall for crude oil producers because the rise in gasoline prices is driven primarily by higher crude oil prices."

Further, a Center for American Progress analysis compared five years of gasoline price data with quarterly Big Oil profits and found that a 1-cent increase in gasoline prices led to $200 million in profits for the largest oil companies (on a quarterly basis).

Oil profits increase when gas prices go up



Source: Energy Information Administration; BP, Chevron, ExxonMobil, Royal Dutch Shell, and ConocoPhillips Quarterly Profit Reports

To be sure, there is no smoking barrel that demonstrates Big Oil is rigging the game to raise gasoline prices. But many of the actions they've taken have the suspicious effect of boosting prices. The following factors suggest that Big Oil companies, with help from Wall Street

speculators, are taking steps that tilt the gasoline-price playing field in their favor, which in turn increases costs for middle-class families:

- The five biggest oil companies made record profits in 2011, as average annual nationwide gasoline prices hit a 36-year high. Yet these companies also produced less oil.
- Every 1-cent increase in gasoline price yields $200 million in profit (on a quarterly basis) for the largest oil companies.
- U.S. exports of refined petroleum products doubled in the past five years.
- Oil companies are holding thousands of unexplored or undeveloped leases in federal lands and waters.
- Oil companies are also closing refineries, threatening to slash fuel supplies.
- Big Oil companies will receive $40 billion in unnecessary tax breaks over the next decade.
- Wall Street speculators are trading twice as many oil futures as commercial end users.

For more information about each of these factors, see our report, "Are Oil Companies Rigging Gasoline Prices?"

Americans have a right to be suspicious that the gasoline game is fixed. Right now we have more domestic production, less demand, and no major supply disruptions, which should ease gasoline price pressure. Yet Big Oil companies are making higher profits, lowering production, sitting on thousands of unused leases, exporting more refined products, and shuttering refineries, which, combined with excessive Wall Street speculation, are all energy industry actions that tend to boost gasoline prices. Clearly the $40 billion of Big Oil tax breaks are wasted revenues that could be invested in technologies that reduce oil use, which would lower families' spending on gasoline.

Policies that could reduce gas prices

Support investments that reduce oil use

Even as we produce more and use less oil at home, oil prices remain subject to the global market. The 2011 disruption in Libya's oil production sent prices climbing. This year, Iran's saber-rattling to use oil as a weapon to defend its nuclear program is roiling markets. This destructive price volatility will continue to harm our economy and Americans if we continue to depend on a product with few substitutes where we consume 20 percent of the annual supply but only 2 percent of its resources. The ultimate path to long-term relief is to dramatically reduce our reliance on oil. **The most effective way to reduce pain at the pump is to reduce our oil use so we pump less.**

The United States must develop modern fuel economy standards to make cars go much farther on a gallon of gas. As noted above, the administration will soon finalize fuel economy standards for passenger vehicles manufactured from 2017–2025. If the standards are kept strong, they will save more than 2 million barrels of oil per day. Congress must resist pleadings of special

interests to reduce or delay these standards since they will only increase gasoline consumption and prices.

In addition to much-improved vehicle fuel economy standards, we must begin the investment in cars and trucks powered by other fuels. Passenger vehicles could use readily available, increasingly clean electricity. Plug-in hybrids and all electric vehicles consume little or no gasoline. The Chevrolet Volt and Nissan Leaf are two early electricity powered vehicles. The Volt was even named "2011 Motor Trend Car of the Year." During their first year of production, their combined sales were twice as large as the now familiar Toyota Prius hybrid during its first year.

As with cell phones, desktop computers, and other innovative new technologies, there will be bumps along the road to widespread commercialization. For instance, bad publicity for the Volt due to overstated concerns about the potential for fires has inhibited sales. Nonetheless, February 2012 sales were significantly higher than January sales. In March, Chevrolet sold more Volts than in any previous month. Despite GM's temporary halt in production to sell some existing inventory, it still plans to sell 45,000 Volts in 2012 – six times more than last year.

Despite the Volt's recognition as an innovative, impressive vehicle, it has suffered attacks from conservatives. These conservatives sound like they are rooting for General Motors to fail, even though this plug-in hybrid technology could dramatically reduce oil use and pain at the pump. These condemnations are equivalent to assaulting the first cell phones, desk top computers, or iPads for being too big, too expensive, or too limited – common concerns with brand new game changing technologies. Those who criticize the Volt in their attempt to score political points should be ashamed of their attacks on American ingenuity and innovation.

The Volt and other innovative American oil savings technologies require enhanced infrastructure to speed their adoption. There is a long history of government support for the infrastructure essential to grow pioneering technologies, from FM radio to telephones. Electric vehicles, too, would benefit from such assistance with recharging infrastructure. The Electric Drive Vehicle Deployment Act of 2011, H.R.1685, sponsored by Reps. Judy Biggert (R-IL) and Ed Markey (D-MA) would provide financial assistance to states for the deployment of electric vehicles.

Investments in buses, subways, and trains can also reduce our dependence on oil and create jobs. Public transportation saves the U.S. 900,000 automobile fill-ups per day, which equal 4.2 billion gallons of gasoline per year. Every $1 billion of investment in public transportation infrastructure supports 36,000 jobs in a variety of industries – construction, finance, insurance, real estate, retail and more.

Despite these overwhelming benefits, our public transportation infrastructure is woefully underfunded. A recent CAP report "Meeting the Infrastructure Imperative: An Affordable Plan to Put Americans Back to Work Rebuilding Our Nation's Infrastructure," by Donna Cooper found that an additional investment of $15.7 billion annually is needed to meet our most urgent public transportation infrastructure needs. This would increase oil savings and create jobs.

Unfortunately, the pending House transportation bill would undermine our existing transportation infrastructure. It would end the 30-year practice of allocating a small portion of the federal gas tax for transit funding. It would replace this predictable funding source with reliance on lower, speculative revenue from future oil drilling. The American Public Transit Association predicts that the House bill will

> "Lead to additional deferred maintenance, leading to less reliable service, fewer transit extensions, higher fares and potentially fewer riders."

This significant cut in transit ridership would force more people to drive, using more gasoline to travel. This additional demand would likely increase gasoline prices.

Ryan budget keeps Big Oil tax breaks, cuts investments that reduce oil dependence

The House passed FY 2013 budget resolution, authored by Rep. Paul Ryan (R-WI), would *worsen* pain at the pump by slashing billions of dollars of investments in transit, alternative fuels and clean energy technologies that would reduce oil consumption. Such investments help protect middle-class families from volatile energy prices as well as create jobs. Instead, the budget would retain $40 billion in tax breaks for big oil.

The Office of Management and Budget warned that the Ryan budget could devastate clean energy investments:

> "Clean energy programs would be cut by 19 percent over the next decade, derailing efforts to put a million electric vehicles on the road by 2015, retrofit residential homes to save energy and consumers money, and make the commercial building sector 20 percent more efficient by 2022."

In addition, the Ryan budget would cut transportation funding by more than one-third in 2013, with public transit—buses, subways, and trains—likely to be a major target. Such a steep revenue decrease would reduce accessibility and affordability of public transportation, which would increase demand for gasoline and drive up its price. The American Public Transportation Association reported that "transit reduces annual fuel use by the equivalent of 4.2 billion gallons of gasoline."

In short, the Ryan budget compounds the cost of high oil and gasoline prices by slashing investments in alternatives that lessen oil demand and reduce costs for the middle class.

Selling some reserve oil could provide *temporary* relief

The Wall Street Journal, Cato Institute, and a survey of economists by the University of Chicago Booth School of Business, noted that President Obama cannot affect gasoline prices. There is a proven tool, however, that can provide some temporary relief from high prices in the short term. Selling a small amount of oil from the Strategic Petroleum Reserve in coordination with sales from International Energy Agency reserves could suddenly expand the world oil supplies by millions of barrels over a month or two.

The Strategic Petroleum Reserve is 96 percent full. Selling a small amount of reserve oil in conjunction with our allies—say 45 million barrels each—would still leave the reserve 90 percent full. It's important to note that the 104th Congress under then-Speaker Newt Gingrich sold 28 million barrels of reserve oil in 1996 to reduce the budget deficit when the reserve was less than 80 percent full.

Selling SPR oil can temporarily lower oil and gasoline prices by bursting the "bubble" caused by Wall Street speculators betting that oil prices will continue to rise due to fears of supply disruption in the Persian Gulf. Such a sale has occurred under the past four presidents and has lowered oil and gasoline prices every time. This can cut prices and burst the bubble—even recent rumors of a reserve oil sale reduced prices. On March 15 Bloomberg reported:

> "Oil [prices] fell … on reports that President Barack Obama discussed a release from the U.S. Strategic Petroleum Reserve with UK Prime Minister David Cameron."

Crack down on Wall Street speculators

Another measure that would lower oil and gasoline prices would be to lessen Wall Street speculators' ability to drive up prices. Many experts believe that these speculators—who never intend to take position of the oil that they buy—are driving up oil prices to make a quick profit, preying on the fears of commercial end users who attempt to lock in a favorable future price.

The impact of public health and work safety standards on price

After BP tragedy, new safety measures adopted while drilling returns to normal

The BP Deepwater Horizon disaster was the worst offshore oil spill in the nation's history. It tragically took the lives of 11 men. 210 million gallons of oil bled into the Gulf of Mexico, with a long-term economic and biological impact that is still unknown. Gulf Coast residents and businesses have or will receive a total of at least $22 billion in compensation for economic harm from this disaster.

In the wake of this unprecedented calamity, the U.S. Department of the Interior called a time-out on offshore drilling to make sure that there were no other tragedies waiting to happen. The bipartisan National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling conducted a thorough investigation of this disaster and essentially concluded that this was a prudent step:

> "The immediate causes of the Macondo well blowout can be traced to a series of identifiable mistakes made by BP, Halliburton, and Transocean that reveal such systematic failures in risk management that they place in doubt the safety culture of the entire industry.

> "Deepwater energy exploration and production, particularly at the frontiers of experience, involve risks for which neither industry nor government has been adequately prepared, but for which they can and must be prepared in the future.
>
> "To assure human safety and environmental protection, regulatory oversight of leasing, energy exploration, and production require reforms even beyond those significant reforms already initiated since the Deepwater Horizon disaster."

The Department of the Interior has adopted a number of reforms to enhance worker and drilling safety, as well as "continu[ing] to process permits to drill as efficiently as is safely possible." Since October 12, 2010, the Bureau of Safety and Environmental Enforcement has approved 84 percent of the new and revised deep-water well permits.

Even with the new safety measures, offshore oil rigs are returning to their pre-BP disaster numbers. On April 10 Reuters reported that,

> "Gulf of Mexico oil drillers will be busier this year than at any point since the BP (BP.L) oil spill in 2010 that upended their industry and soiled their reputation along with parts of the marshy Louisiana coast.
>
> "Eight more deepwater rigs are expected in the Gulf this year, based on what oil companies tell contractors … Such an influx would bring the active deepwater count to 29, just short of the level before the well blowout two years ago this month that killed 11 people."

While the Obama administration has taken strides to improve the safety of offshore drilling, Congress has not. It is irresponsible that the liability limits for economic damages from offshore oil spills remains an embarrassingly low $75 million. This is less than 0.5 percent of the $13.8 billion BP has already paid in claims for damages from the Deepwater debacle.

Put another way, in 2011 the big five oil companies earned $137 billion in profits. —the $75 million appropriated by Congress represents about five hours of profits for these corporations. A higher liability limit would further encourage companies to follow safe operating procedures. This unconscionably low limit is completely insufficient to change behavior.

As previously noted, it is important to remember that there was more oil produced from federal lands and waters in 2011 than in any of the last three years of the Bush administration—and these rigs are safer now, too. It is fairly clear that these safety measures have had no impact on high oil and gasoline prices.

Allowing more pollution from gasoline won't lower gasoline prices

Another regular proposal to lower gasoline prices is to waive the summer pollution reduction requirements for gasoline in metropolitan areas with severe smog problems. These standards reduce contaminants produced by gasoline combustion, such as nitrogen oxides and volatile organic compounds that form ground level ozone (smog) in the presence of sunlight. The

American Lung Association warns that ozone causes "increased risk of premature death," "asthma attacks," and "increased susceptibility" to heart- and lung-related problems. Children, seniors, and those with respiratory ailments are most vulnerable to harm from smog.

According to an EPA analysis, abandoning these cleaner gasoline rules *might* reduce gasoline costs by only a few cents per gallon but would increase smog that harms children, seniors, and others. In addition to human suffering, such a step would have real economic costs due to additional health care expenditures and lost productivity.

The Congressional Research Service recently concurred that relaxing these clean fuels standard would require other polluters to make steeper, more expensive pollution reductions.

> "Relaxing these standards long-term may require states that use special blends as part of their plan to meet NAAQS [National Ambient Air Quality Standards that protect public health] to come up with alternative--potentially more commercially costly--means to meet air quality targets."

State Department: Keystone pipeline won't increase production or lower prices

Other oil industry advocates claim that completing the Keystone XL pipeline from Alberta, Canada, to the Gulf of Mexico would both increase oil supplies and reduce prices. The State Department's analysis of the project found that neither assertion is accurate.

The State Department's final "Keystone XL Assessment" concluded that it would not increase oil supply or lower prices:

> "WORLD and ETP studies indicate that building versus not building Keystone XL would not of itself have any significant impact on: U.S. total crude runs, total crude and product import levels or costs." (emphasis original)

The State Department analysis determined that the pipeline would only have a tiny impact on the price of crude and other products:

> "Under the KXL scenario, delivered prices for [oil sands] ... into PADD3 Gulf Coast are lower than under the No KXL case and those for PADD2 [Midwest], higher. The effect is limited, no more than around $0.70/bbl [per barrel]."

The analysis acknowledges that the pipeline would actually raise gasoline prices in the Midwest since it would eliminate the current oil glut there that has kept prices lower. Bloomberg cautions that, "TransCanada Corp.'s Keystone XL oil pipeline ... risks raising prices as much as 20 cents a gallon in the Midwest, Great Plains and Rocky Mountains." At the same time, there may be a decrease in gasoline prices in the Gulf region because of the increase in oil supply there.

Time magazine's analysis concurred that Keystone would have almost no impact on gasoline prices. "Keystone would have little immediate [price] effect, especially since there's already sufficient pipeline infrastructure in place for the next few years."

Additionally, there are indications that a portion of the oil sands piped through Keystone to Gulf Coast refineries will be refined into products for export rather than kept here for American drivers. At a December 2, 2011, hearing before a subcommittee, Rep. Ed Markey (D-MA) asked the CEO of pipeline-owner TransCanada whether he would agree to keep all refined products from oil sands in the United States. He declined.

One way to ensure that Keystone adds a marginal amount of oil to U.S. supplies is to require that the oil and its refined products be sold here—not exported. On February 15 Rep. Markey offered an amendment to H.R. 3408 to "ensure that if the Keystone XL pipeline is built, the oil that it transports to the Gulf of Mexico and the fuels made from that oil remain in this country to benefit Americans." The amendment failed 173–254, which means that some of the oil sands will be exported.

Some advocates of building this pipeline claim that it would also help lower gasoline prices because this project is "shovel ready." This is also false. The Keystone pipeline isn't even *map* ready yet since its route through Nebraska has yet to be publicly announced. And there has been no assessment of the potential harm to adjacent air, water, and land from its construction and operation once it is sited.

In fact, there is a growing controversy over building the pipeline in places where the route is *already* mapped. The *Los Angeles Times* reported on the conflict between landowners and TransCanada:

> "Canadian company that wants to build the 1,660-mile structure [is] going to court to force the cooperation of landowners who don't want it crossing their land.
>
> "The issue has brought conservative tea party groups out rallying alongside environmentalists opposed to tar sands oil production, united behind [Julia Trigg] Crawford's attempt to keep the pipeline from crossing her 600-acre farm in the town of Direct, near Paris, where she fears it could contaminate the creek that irrigates her fields."

This controversy suggests that construction is not "shovel ready" outside of Nebraska either.

The bottom line is that the State Department and other independent analyses determined that the Keystone XL pipeline won't increase U.S. oil supplies, reduce gasoline prices, or even transport any oil anytime soon.

Lifting protection for special places won't reduce oil or gasoline prices

Some people are calling for more oil drilling in protected places to reduce gasoline prices, though they disingenuously neglect to mention that it takes seven years for new offshore oil drilling to produce any oil. And EIA found that opening up the currently protected Atlantic and Pacific Coasts won't have an impact on price. EIA also predicts that it will take 10 years to produce oil from the Arctic National Wildlife Refuge in Alaska.

Don't get me wrong. More American oil production benefits us in several ways. First, producing more and importing less would help our balance of trade. In 2010 it was estimated that oil imports were nearly half of our trade deficit. The nearly $1 billion sent overseas daily to purchase oil is money that will not recirculate here or create more economic growth.

Purchasing less foreign oil also enhances our national security. Canada and Mexico are our two largest importers. But a CAP analysis found one in five barrels of oil consumed in the United States in 2008 came from nations classified as "dangerous or unstable."

These are real economic and security benefits to our nation, and higher oil production should continue. At the same time, more U.S. production will not lower prices because oil prices are set on a worldwide market price, with the active participation of the Organization of Petroleum Exporting Countries, or OPEC, cartel. A significant production increase by one country could be offset by a reduction by another nation so that the price remains the same.

In fact, some oil-producing nations believe that some oil producers want to stabilize prices around $100 per barrel. In an interview with CNN, Saudi Arabian Oil Minister Ali al-Naimi said that, "Our wish and hope is we can stabilize this oil price and keep it at a level around $100" for the average barrel of crude oil. Saudi Arabia and other OPEC countries have the ability to raise or lower their production to accomplish this goal.

Ken Green, resident scholar with the conservative American Enterprise Institute, explained that crude oil is a global commodity whose price will be unaffected by new U.S. production. Last year Greenwire reported that Green said:

> '"The world price is the world price. Even if we were producing 100 percent of our oil,' Green said, if prices increase because of a shortage in China or India, 'our price would go up to the same thing…We probably couldn't produce enough to affect the world price of oil,' he added. 'People don't understand that.'"

Green also astutely predicted that some politicians would exploit higher oil prices to boost Big Oil's desire to drill on fragile lands and in coastal waters. "We're likely to see a replay of the McCain-Palin 'drill, baby, drill,' 'drill here, drill now.' It will probably be a cause célèbre for the party." His warning was prescient—those same cries are occurring this year as well.

Green is correct. Allowing production into protected, fragile places will not lower oil and gasoline prices today, tomorrow, next year, or the year after that.

The National Petroleum Council safety recommendations would

The National Petroleum Council report "Prudent Development" has critical recommendations that would increase the ability of big oil and gas companies to produce resources without harming public health, hunting and fishing, and other environmental values. It noted in its letter to Secretary of Energy Steven Chu that

> "Positive outcomes of increased North American natural gas and oil resources can only be realized if developed prudently.
>
> "Realizing the benefits of natural gas and oil depends on environmentally responsible development…in all circumstances."

The report describes "environmentally sustainable" in broad terms to include well construction and operation, wastewater disposal, truck traffic and emissions, and land use. It notes that

> "Environmental sustainability encompasses impacts such as air and water pollution that directly affect public health, as well as these and other impacts affecting ecosystem vitality, biodiversity, habitat, forestry, and fisheries' health, agriculture and the global climate."

.The pollution from surface activities could have serious impact in areas far beyond the well pad. For instance, a peer reviewed study in the *Proceedings of the National Academy of Sciences* released on April 9 determined that methane pollution from natural gas production and use could be greater than originally understood. Dr. Joseph Romm wrote in *Climate Progress* that

> "Methane [is] a very potent greenhouse gas, though with a much shorter lifetime in the atmosphere than CO2, which is emitted by burning fossil fuels like natural gas. Recent studies suggest a very high global warming potential (GWP) for CH4 vs CO2, particularly over a 20-year time frame."

The PNAS study that "it appears that current [methane] leakage rates are higher than previously thought" and "reductions in ch4 leakage are needed to maximize the climate benefits of natural gas." This is the type of problem that the NPC believes that government must help address through more research, establishment of science based pollution reduction standards, and vigorous enforcement of them.

The NPC also strongly advocates a greenhouse gas pollution reduction regime. The United States needs a

> "Mechanism for putting a price on greenhouse gas emissions that is economy-wide, market-based, predictable, transparent."

Finally, the NPC noted that an essential element of protecting public health and the environment is ensuring that federal and state agencies overseeing shale oil and gas fracking have the resources necessary to enforce the law.

> "Regulators at the federal and state level should have sufficient funding to ensure adequate personnel, training, technical expertise, and effective enforcement."

Sustainable production is an essential element in efforts to dramatically expand the production of shale oil and gas. As you know, a major blow-out or spill on land could quickly sour public support for production of these newly available resources. In addition to threatening public health and local economies, such an event could taint other companies conducting similar operations even if they comply with safety rules and employ best practices.

Unfortunately, the hired advocates for these companies frequently argue for the opposite – the weakest, narrowest possible protection standards, claiming that its multi-billion dollar member companies cannot afford to fully protect public health and safety. This argument lacks credibility when the big five oil and gas companies made $1 trillion in profits from 2001-2011. When oil costs an average of $15 per barrel to produce sells for $100, a small increase in production costs to protect people from toxic chemicals in their air and water, deadly diesel particles, and an increase in climate change pollutions is a cost-effective investment.

Chairman HALL. Dr. Weiss, thank you very much, and I thank all the witness. This Committee was dubbed the Committee of the Day, and I see why. All five of you have certainly given us a good basis for our questions, and I thank you for your testimony. I will remind our Members that the Committee rules limit questioning to five minutes. We will try to stay close to that. The Chair at this time will open the round of questions, and I recognize myself for five minutes.

I will start off. Mr. Slaughter, your testimony described the National Petroleum Council's "Prudent Development" report in detail. The report's findings on the amount of economically recoverable oil and gas resources are very striking. Could you describe just how much oil and gas we now think is recoverable and what that means in the context of global energy resources over the coming decades? How has the development of new energy exploration and production technology increased the estimated resource base? Those are three questions in one but you can handle them any way you want to.

Mr. SLAUGHTER. Sure, and just a clarification to start off with, resource is a wider term than the reserves estimate, which Mr. Weiss just mentioned. Reserves is a very narrow definition based on current technology and current economics.

When we are looking at future development over several decades, we look at technically recoverable resources and ultimately recoverable resources. Today's technology, we define the total unconventional resources at about 180 billion barrels, which is additive to the conventional resources of approximately 185 billion barrels. But as we move into technology development in some of these longer-term plays, we could be recovering over 1 trillion barrels of oil in several decades if you include resources like the oil shale of Colorado, which can be developed in several decades' time if we keep working on the technologies to develop that. So these are huge amounts of oil.

Chairman HALL. Yes, and I thank you.

Dr. Foss, given the potential amount of domestic energy we now realize that we can access, it is really appropriate to suggest that we only have two percent, as the President says, of the world's oil resources, as President Obama suggests? How correct is that?

Dr. FOSS. Well, again, like Andrew, the use of the word "resource" and other words are often confused. I have a chart that I submitted in testimony, and it is a big of an exaggeration, admittedly, because I did the same thing but to make a point. In our country, because we have transparent government data, we have transparent industry data and lots of processes for looking at that information, we feel comfortable that we can look at our resource potential the way we do, and it puts us at the top of the world in terms of overall resource wealth. Now, what you do to deliver the ultimately recoverable resource into the market at any one time, that is a different question. We have much more than two percent of the world's known resources. In fact, we have the majority of the world's known resources if every country went out and did the same things that we did to evaluate the resource base and maybe that percentage would change. But for the time being, we are extremely large.

Chairman HALL. I thank you for that. I have a minute and 42 seconds left. Let me ask one more question.

President Obama's position is that because the price of oil is set on a global market, there is little or nothing that the United States policymakers can do to impact gas prices. Ms. Harbert and Dr. Foss, you both touched on this in your testimony. If the President increased oil production or even signaled that he intended to increase oil production in such areas as Alaska where little ANWR is just 19 million acres, or the Outer Continental Shelf, would prices be impacted?

Ms. HARBERT. When you look at the statistics from the International Energy Agency, the global demand for energy is going to go up by 50 percent. If we do not increase supply, we will be certain of one thing: prices will go up. So what are we doing here at home to inoculate ourselves against that inevitable price increase if we don't increase supply? We have an opportunity to be part of our own solution which we are depriving ourselves of. So if you look at the longer-term market fundamentals that are basically supply and demand, without more supply, and we have a lot of it, prices will go up.

Chairman HALL. Dr. Foss?

Dr. FOSS. Yes. Thank you. Studies of the type that have been mentioned today looking at domestic gas production and gasoline prices are inevitably flawed because they do not take into account the impact of not having domestic production on gasoline prices, which——

Chairman HALL. I just have about 10 more seconds, so go ahead.

Dr. FOSS. And I also think that one thing that we haven't put on the table today is the cost of other things that impact gasoline prices to customers: the ethanol mandate, taxes on gasoline and other things that actually make gasoline purchases expense for households.

Chairman HALL. I thank you, and I now recognize Mrs. Johnson for her five minutes.

Ms. JOHNSON. Thank you very much. I noticed that some of the testimony indicates support for a continued role for the federal research into oil and gas drilling-related technologies, and I realize that in many of your responses you have already indicated that it would take decades to produce from these sources that you are speaking of. In what way do you think that the Federal Government should continue to invest in research right now during this very scarce taxpayer dollars for research?

Mr. SLAUGHTER. If I can have a go at that, what we are looking at here is some parts of the resource base which are pre-commercial by quite a long time and so the private sector by itself does not put a lot of investment focus on pre-commercial resources, for example, the oil shale or the oil sands or methane hydrates in natural gas. So in these circumstances, to keep the necessary research and development effort going, we in the NPC study recommended partnerships of industry, academia and government to keep the momentum going on those essential technology development programs.

Ms. JOHNSON. It really sounds great to talk about all the drilling that we can do and all of the resources we have and we talk about the oil shale and all. It would take decades to produce, wouldn't it?

Mr. SLAUGHTER. The development pathway for oil shale particularly is long but if we want to have it available when we need it, then we need to keep working on it. It won't be available if we stop working on those questions now.

Ms. JOHNSON. How much do you think that the private industry is willing to fill in while we don't have the dollars for the research?

Chairman HALL. Ms. Harbert, you were trying to ask a question or answer a question?

Ms. HARBERT. I was just going to say, the Department of Energy answered that question. They issued a report in 2007. They were asked to look at all the private-sector activities underway to develop the technology and they issued a report of every—whether it is Exxon or Shell or Red leaf or Whiting, all the multitude of companies that have been investing in developing this technology on their own dime without asking for any subsidies from the Federal Government. What the industry is asking for is some certainty, that knowing that I can have access to this resource base so I can develop the technology, make it commercially viable and bring this resource to market in a reasonable time frame, and adhering to all the environmental regulations that are in place.

So we have a very good idea of the multitude of technologies that are under development but if the opportunities being closed down to access the resource base, they are not going to develop the technology. I don't think you will find anybody in the industry that is saying we need more money from the Federal Government. They are saying we just need the opportunity. The economic conditions have changed dramatically for this resource and now they want to be able to have the opportunity to develop it.

Ms. JOHNSON. Thank you.

Mr. Brown, you mentioned some of the oil shale availability. What is your company doing at this time to access that resource?

Mr. BROWN. Can I ask for a clarification? When you are saying the oil shale, you are talking about like western Colorado, the very—one of the companies that I mentioned the acquisition that Whiting made early in their—well, after they went public in 2003, one of those companies owned a very large oil shale position in western Colorado, and we—and they owned it outright. It was actually granted to them by the government back in the 1930s to develop, and they own it in fees, so they own the minerals, they own the—or we own the minerals, we own the surface.

Currently, we are not doing anything out there. I mean, it is not a lease that is going to go away on us. We are producing hydrocarbons from other zones on that lease out there because it is productive in the deeper zone for natural gas. But right now we can't see a path forward that makes that an economic project in any reasonable time.

Ms. JOHNSON. What do you mean, you can't see a path forward?

Mr. BROWN. You know, you have to somehow be able to generate a lot of heat down in the reservoir to make this project—to turn the kerogen into a liquid hydrocarbon product, which Shell is actively pursuing out there right now. Right now, we don't—to be

able to do that, we can't see that it is an economic venture for us to undertake at this time.

Ms. JOHNSON. I have less than 10 seconds, so I am going to do Ms. Adams' technique. Just answer yes or no for all of you. Is President Obama the cause for the high gas prices right now? Just yes or no down the line.

Mr. SLAUGHTER. No.

Ms. HARBERT. Yes and no.

Ms. JOHNSON. I just need one of those.

Ms. HARBERT. Yes and no. It is too complex to go to a yes or no question—answer, quite honestly.

Ms. JOHNSON. Next?

Dr. FOSS. Same for me.

Mr. BROWN. No.

Mr. WEISS. No.

Ms. JOHNSON. Thank you for the truth. Thank you.

Chairman HALL. The gentlelady's time is up, and I recognize the gentleman from Alabama, Mr. Brooks. And thank you for staying within the time, Ms. Johnson.

Mr. BROOKS. Thank you.

I would like to hear Ms. Harbert and Dr. Foss expound on why they believe that the White House policies are partially responsible for our American soaring gasoline prices.

Ms. HARBERT. Well, if we were to have access to federal offshore and onshore lands, and then you take a much more aggressive stance on unconventional oil shale, and then you add to that the Keystone pipeline, which would bring more resources to the—you combine all those together, there is a lot of government revenue, a lot of new supply, and America then stands on a very different energy footing, and those are just three things to start, and that is jobs, it is revenue, it is energy security, and that would dramatically alter our standing in terms of our power within the global energy market.

Mr. BROOKS. Dr. Foss?

Dr. FOSS. I don't think the question is about gasoline prices. I think that is the wrong way of looking at things. I think the point is to look at household—the transportation portion of household energy cost, and I think the problem is that a lot of the alternatives that you are spending both taxpayer dollars on and private money on are more expensive than actually the things that can be done to encourage more efficient use of the existing petroleum product base that we have.

Mr. BROOKS. Now, I presume each of you is aware that in September of 2008, Dr. Steven Chu, the current Secretary of Energy for Barack Obama, said "Somehow we have to figure out how to boost the price of gasoline to the levels in Europe." Currently, gasoline prices in Europe range from $6 to $8 per gallon, and quite frankly, when I got gasoline a couple of days ago coming into Washington, over $4 per gallon. That was a first for me, and I searched for 30 minutes trying to find something less expensive but finally gave up. Now, Secretary Chu had the opportunity in this very room to backtrack on his position; he did not. However, later in a Senate hearing, he did backtrack. I personally believe that his original statement that he wanted to essentially double gasoline

prices on American citizens reflects his true beliefs inasmuch as he backtracked in the Senate after having had the opportunity to do so here and did not but in the Senate. We all understand this is an election year, and I would suspect that in an election year setting, that had something to do with his views. Perhaps we can give him the benefit of the doubt. The public can make a final judgment on that.

But having said all that, if Secretary Chu's preference for doubling American gasoline prices were to occur, what would it mean for the United States economy if gasoline were at European levels, and I would like to direct that question to Ms. Harbert and Dr. Foss.

Ms. HARBERT. We would look like Europe, which doesn't look very good right now. I was just there a couple of weeks ago, and there is a great deal of discussion about how to change this very entrenched, very long-term approach towards taxing fuels. I think there is proof in the pudding coming up this summer. Given the weakness of the European economy, the cost to customers and businesses, I think that we are going to be seeing some pretty interesting eruptions with respect to how fuels are taxed over there.

Americans are already paying 8.5 percent of their household income on gasoline, and that would go up. That is the highest level since 1981. It would impact certainly the economic recovery, our GDP, and it would affect business investment. Let us not forget that manufacturing is starting to figure out how it can get back on its feet based on low natural gas prices. We have the chemical industry that left this country and went to the Middle East because there were lower natural gas prices there. They are now coming back, and we want to see those types of things happen. And so price matters, and that matters in our economy, it matters in business decisions, it matters in investment decisions, and it certainly matters at the family dinner table. So it would have a very bad knockoff effect on the economy.

Mr. BROOKS. But again, I personally believe for emphasis that it is the White House strategy to drive up energy prices in order to make them more competitive with the exotics that this Administration is pouring so many billions of tax dollars into. But having said that, President Obama repeatedly claims he supports an all-of-the-above energy strategy. However, the President's rhetoric rarely matches his Administration's actions, especially when it comes to the EPA and its regulatory culture. Can you please describe what EPA's numerous proposed regulations such as the recently proposed New Source Performance Standards for Power Plants and Cross State Air Pollution Rule as well as forthcoming rules on greenhouse gas emissions at drilling sites and tier three refining standards mean for the United States energy use and energy prices? And again, Dr. Foss or Ms. Harbert, very quickly.

Ms. HARBERT. The real answer is that no one knows because the modeling of those combined rules and regulations have not been done, and so we really don't know the ultimate cost and what it is going to do to energy prices. And that is why in some cases the court system has stepped in and stalled the implementation of some of these regulations until more review has been done.

Mr. BROOKS. Well, Mr. Chairman, if I could just add a comment, since my time is expired, for Dr. Foss. I sincerely believe that it is another effort to jack up prices.

Chairman HALL. The gentleman's time is expired.

Mr. Miller, the gentleman from North Carolina, is recognized for five minutes. Is he here? All right. Who is next? Mr. McNerney, you are recognized for 5–1/2 minutes.

Mr. MCNERNEY. Thank you, Mr. Chairman.

I want to thank the panel. I think all your testimonies were very well thought out and I appreciate what you are bringing to the table here.

Mr. Slaughter, all Americans are clearly struggling with the price of gasoline now, and there is no doubt in my mind that there is a lot of gas or a lot of oil there from all sources within our borders. But I am worried about the costs both direct and indirect of extracting some of these unconventional sources. For example, I worry a little bit about the effects of global warming as do a lot of people, but let us talk about the economics here. Are the unconventional sources more expensive per barrel to extract than conventional sources?

Mr. SLAUGHTER. That depends. Not all unconventional sources look alike. Many of the tight oil resources that have been ramping up production now and over the last couple of years are actually not on the margin as the most costly production. Some of the more frontier-type resources like, for example, the oil sands tend to be the most expensive but they are economic in today's environment.

Mr. MCNERNEY. Well, the unconventional sources have unique risks regarding the environment. What safeguards do you think should be in place to reduce the risk of extracting these hydrocarbons in a safe manner?

Mr. SLAUGHTER. The NPC study did a tremendous amount of work on this question, and the oil and gas companies take this very seriously. So there is a lot of recommendations in that study about disseminating best practices, developing responsible extraction technologies, about promoting councils of excellence to raise the game in terms of environmental performance. This is something we have to do and we have to take it seriously.

Mr. MCNERNEY. I agree. If local extraction causes local environment pollution and contamination of groundwater, local communities will turn against that. So we want to make sure that that doesn't happen as part of the outcome.

Ms. Harbert, thank you for your testimony again. In your written testimony, I believe I took that you indicate that while U.S. demand for oil has decreased in recent years, an increasing international demand has led to increasing prices in gas at home. How much impact do you think recent American policy has on domestic gasoline prices?

Ms. HARBERT. Well, you know, the reason we have decreased demand is for a very unfortunate reason, which is the recession that we have all been suffering through. So we certainly don't want to substitute that for an energy policy. We know the economy is going to recover. We will hope it recovers as fast as it possibly can and that is going to command more energy, you know, consumed domestically. So if we look at, you know, what is the effect of the re-

cession on the global energy price, I don't know that anybody knows the answer to that. Maybe my friend here to the left that is an economist can quantify that for us.

But I will say when we look outwards and we look at the increasing demand from China, India, the Middle East—which is the second-fastest growing region for energy consumption—we know we are going to need more supply. And so it is incumbent upon us to look at all of our tools in our toolbox, whether it is increasing access, whether it is examining taxes, whether it is examining all the different things that we have to ensure that we are maximizing our competitive advantage here, because we do have a lot of resources and we could certainly be using that as the foundation to compete more effectively in a very, very globally competitive market.

Mr. MCNERNEY. Thank you. Mr. Weiss, you have——

Mr. WEISS. Mr. McNerney, two things about that: first, studies have indicated the reason why demand is down is due to increased fuel economy standards that this Congress passed in 2007 and Mr.—President Obama implemented in 2009; second, the International Energy Agency reports that estimated demand worldwide for oil is only up about one percent this quarter compared to the previous quarter. So I don't believe there is a huge increase in demand that is driving up oil prices, and in fact, research by McClatchy and others indicates that it is Wall Street speculators that are helping to drive up the price of oil due to preying on fears of a supply disruption in the Persian Gulf.

Mr. MCNERNEY. I think you sort of answered my next question to Ms. Harbert.

We have heard a lot about domestic production; we haven't heard a lot about efficiency of our automobiles. Do you think that that has had any impact on the price we are paying for gasoline today?

Ms. HARBERT. I think everybody recognizes that, as an economy, we certainly can become more efficient and that means in our transportation sector and in our electricity infrastructure without a doubt. Since the fuel standards that were put in place and are coming into the marketplace, they—a lot of people haven't bought cars recently. The new cars that have the efficiency standards, just based on our economy, will they have an impact on reducing the amount of consumption over time? I mean I think that was the—ultimately the purpose of that. And I think we have to examine all ways we can become more efficient without a doubt. But the real answer is that the reason we have had decreased demand is directly tied to the economy, but the fuel standards will certainly have some beneficial impact in the out years.

Mr. WEISS. One point of fact: the auto companies are on record to produce more—sell more cars this year than any year since 2007.

Mr. MCNERNEY. Okay, thank you.

Mr. Chairman, I had better yield back or I will get the gavel.

Chairman HALL. You won't get the gavel but thank you for yielding back.

The Chair now recognizes Dr. Harris, the gentleman from Maryland.

Dr. HARRIS. Thank you very much. And thank you, Mr. Chairman for holding a hearing on a very important subject. As people

go to that gas pump and see that $4 a gallon at the top and the farmers in my district paying $4 a gallon for diesel and the watermen, they are interested in this. Here is the yes no question. If the President had an epiphany today, got up tomorrow and, you know, in the White House, had a press conference, said that we are going to increase onshore and offshore drilling in the United States, we are going to maximize American energy production, he announced that the $4 billion Department of Energy budget was going to go to research programs to convert natural gas to liquid fuels and—what would the response of the oil market the next day be—price on the oil market? Would it go up or down? Mr. Slaughter? The President announces the United States is going to become an energy leader in the world.

Mr. SLAUGHTER. The oil market is very complex. It depends on many factors——

Dr. HARRIS. Will it go up or down? Because we—it has been done before. See, President Bush did it once so we don't—you know, we actually have historical evidence of what happens.

Mr. SLAUGHTER. Yeah, I have to pass on that one.

Dr. HARRIS. Okay. Ms. Harbert?

Ms. HARBERT. You point out an interesting thing. When President Bush lifted the moratorium, the price of oil went down $9 overnight. I don't know exactly what happened. It is complex. And I will be serious because this is——

Dr. HARRIS. Yeah.

Ms. HARBERT. —a serious issue and we have——

Dr. HARRIS. Sure.

Ms. HARBERT. —to take it seriously. There are a lot of different complicating things in there, but the long-term price signals of the market would be is that America is back open for energy business.

Dr. HARRIS. Thank you very much.

Dr. Foss, you are an economist. What happens to the speculators? What do they get worried about the next day?

Dr. FOSS. Perception is reality and I agree with my friend, Karen Harbert, that a signal like that would have a huge impact, especially given everything else that is going on.

Dr. HARRIS. Sure.

Mr. Brown?

Mr. BROWN. You know, I have been in the business trying to predict the oil price for a long time here, but if you have the ability to do this, let us talk later because we—it could really work to my benefit.

Dr. HARRIS. That is what I thought.

Mr. Weiss?

Mr. WEISS. It would make no difference and would take seven years to produce any oil from increased offshore oil drilling.

Dr. HARRIS. Mr. Weiss, the question was——

Mr. WEISS. It would make no difference——

Dr. HARRIS. —the next day, the next day——

Mr. WEISS. —no difference——

Dr. HARRIS. —there is no difference?

Mr. WEISS. No difference.

Dr. HARRIS. Let us talk about Mr. Weiss' testimony because it is kind of a tome here. Mr. Slaughter, Mr. Weiss says the Council—

the National Petroleum Council "also strongly advocates a greenhouse gas pollution reduction regime." I read that report. I don't see an advocacy for greenhouse gas reduction regime. I see a statement that if you are going to do one, here are the things you ought to do. Did the Council strongly advocate a greenhouse gas reduction regime?

Mr. SLAUGHTER. No, we were all——

Dr. HARRIS. Thank you very much.

Ms. Brown—Mr. Brown, the Secretary of Energy was here and admitted that the Department of Energy spends 1/8 of one percent of their budget on natural gas research, 1/8 of one percent. Now, what can the Federal Government do to help you and your companies develop unconventional oil? Do you think that is an adequate amount for the Department of Energy to spend on research into this field?

Mr. BROWN. You know, for what we do, we try to react very quickly. The reason we built the rock lab for ourselves in Denver is because the commercial labs that are out there will do what we want to do; they won't do it quick enough for us. So if the government is going to invest money in research, it has to be on some of the subjects we talked about earlier. It has to be long-term, has to be something out there. We operate in a much—we have even had these discussions. We support all the universities across Montana, North Dakota—we haven't got to Wyoming yet but we are working on that one—Colorado School of Mines. Academia does not work fast enough for us.

Dr. HARRIS. Sure. So we——

Mr. BROWN. So that——

Dr. HARRIS. I know they need the help. Mr. Brown, the testimony from Mr. Weiss says that the price of oil coming out of the ground is $15 a barrel and of course you are selling it for $100. Mr. Brown, what is your average price of the oil that you produce?

Mr. BROWN. Oh, wow.

Dr. HARRIS. I know because $15 is not what American companies are paying to produce oil. What do you charge or what your cost is?

Mr. BROWN. That is in our SEC filings. You can see our finding cost for oil is around 25 bucks a barrel——

Dr. HARRIS. Twenty-five.

Mr. BROWN. —25, 27, somewhere in there.

Dr. HARRIS. So they are off by a factor of, oh, 60 percent or so. Okay. So it is a second thing and I will look through the rest of this and I will submit some questions for the record later.

Ms. Foss, let me ask you a question. The—what will the effect—the President says, you know, there is $4 billion, oh my gosh, we have to reduce all these subsidies to oil companies at $4 billion. How—if we do that, how in the world are they going to do research if we eliminate the advantages that we give to all businesses whether it is pharmaceutical industry, whether it is the music industry—Apple gets the same benefits. How are we expecting the—because Mr. Brown just suggested that actually you have to be nimble. You actually have to be able to produce some of this research for these groundbreaking technologies. How are we going to

do it if we remove that $4 billion in tax incentives that every manufacturing business in the country gets?

Dr. FOSS. Thank you for making the point that way because that is something that doesn't get spoken correctly I think to the wider audiences. I—we have been through every bit of taxing and forms of taxing and subsidies and credits on different industries and there is no difference between what is done for oil and gas versus anything else. There are very large upfront research and development costs. Exploration is a research and development business. And so in that way, pharmaceuticals is a great example. You sink a lot of money into the business without knowing what you are really going to get for it.

I think the key thing is transparency and predictability and feeling like there is a fiscal regime in the country that is clear, is not going to be handled capriciously, that is consistent. I think all business in the United States appreciates that, not just the oil and gas industry.

Dr. HARRIS. I think you are right.

Thank you very much, Mr. Chairman.

Chairman HALL. And thank you.

The Chair now recognizes Mr. Lujan, gentleman from New Mexico.

Mr. LUJAN. Mr. Chairman, thank you very much. Appreciate the testimony today and you bringing us here today, Mr. Chairman.

A lot of conversations about who is to blame for high gas prices, anyone that truly believes that President Obama or Secretary Chu or Speaker Boehner or Congressman Lujan wants higher fuel prices for the American people, it is not true. And I think that we need to get past this so that way we can start solving the problems. People are paying more at the pump. People are paying more for eggs. Our farmers as well are paying more for diesel. And there are some things that we can do as well. Why is the United States exporting more diesel now in 2011 than ever before? If my farmers are paying more for diesel or we are moving signs or this weekend I was on the Bobcat cleaning up around our sheet bars moving that dirt and it did cost a bundle to be able to fill up that Bobcat. Why are we exporting more diesel?

And therein lies some of the questions that I have is if we produce more oil and natural gas in the United States, we are going to increase supply, correct? That means lower gas prices at the pump for the American people? And I would ask the witnesses yes or no. Mr. Slaughter, we will start, just come down the line.

Mr. SLAUGHTER. All things being equal, more supply in the market of——

Mr. LUJAN. All things being equal, if the United States increases its supply, will fuel prices at the pump go down for the American people?

Mr. SLAUGHTER. It would reduce the supply of crude oil. Refined product prices have more complex dynamics. But all things being equal, it reduces the——

Mr. LUJAN. Ms. Harbert?

Ms. HARBERT. Demand is going up, we need more supply. We don't have the supply, the prices go up. So if we have more supply,

the prices will—that price increase will be somewhat ameliorated, if not go down.

Mr. LUJAN. Okay. Let us stay there for a second. So if the United States increases supply, fuel prices will go down is what you are saying. All right. So do you support—you support increasing production in the United States?

Ms. HARBERT. Is that a question?

Mr. LUJAN. Yes.

Ms. HARBERT. Yes.

Mr. LUJAN. Do you support keeping any increased production in the United States for American consumption to be refined in the United States only?

Ms. HARBERT. To be refined here and then kept here for use?

Mr. LUJAN. Yes.

Ms. HARBERT. So putting up trade barriers to——

Mr. LUJAN. Call them whatever you want.

Ms. HARBERT. —to keep those molecules back in the United States?

Mr. LUJAN. I am saying if we are going to increase production in the United States, shouldn't we keep it in the United States to be able to help the American consumer and American businesses, the people that you represent?

Ms. HARBERT. We are not going to be able to put a ring around the United States, erect a wall and have the price, you know, be dramatically different on the island of the United States versus what it is set on the world market. So—but when you look at the overall world market——

Mr. LUJAN. So then if there is not a little island around the United States, then we won't be able to impact prices. Is that what you are saying?

Ms. HARBERT. No, that is not what I am saying.

Mr. LUJAN. So then if we are able to create this magic ring around the United States and increase production in the United States, shouldn't we keep it here?

Ms. HARBERT. We are not——

Mr. LUJAN. That is what I mean.

Ms. HARBERT. —able to build a hypothetical wall around the United States so this—you started the conversation very——

Mr. LUJAN. Well, then how are we going to——

Ms. HARBERT. —importantly. You said this is a very important subject to maybe get beyond some of this.

Mr. LUJAN. Ms. Harbert, my time is limited. I apologize. If——

Chairman HALL. You have time to let her answer the question.

Mr. LUJAN. Well, Mr. Chairman, I appreciate that but it is my line of questions so we will get through this and I will try to be——

Chairman HALL. Well, I am trying to help you.

Mr. LUJAN. Well, I want to be respectful to our colleagues so I appreciate that, sir. We will submit some things in writing as well.

But these have been conversations we have had in the Natural Resources Committee as well. If I remember correctly, back when the United States built a pipeline after the oil embargos in the early '80s, there was a requirement that was put in place by this Congress by one of our Republican colleagues that authored the amendment that said any oil that flows through this pipe is for

American consumption. They built a little circle around us then and it helped the American people, right? So I don't know why we are having this fundamental disagreement today where if we are going to increase production, American people are hitting $4 a gallon, some places higher. Diesel, which is a byproduct that we are exporting more now is hitting our farmers and ranchers even harder. Why don't we say——

Chairman HALL. All right. The gentleman is using all of his time for his question. If we can get to the question and let them give a quick answer.

Mr. LUJAN. Mr. Chairman—one second. Mr. Chairman, if I may ask that time be suspended and ask a personal inquiry here, the rules allow for a Member to get five minutes to be able to ask questions in any way that they so choose, but when Members of the other side of the aisle are interrupting answers that are coming in, no one was correcting to be able to ask the witnesses to respond in a certain way.

Chairman HALL. I tried to give everybody five minutes, but if some of you go over and some of you go over with your questions.

Mr. LUJAN. But it is important.

Chairman HALL. All right. Go ahead and go with it. How much time did he have coming?

Mr. LUJAN. I was about 1 minute 40 if I am not mistaken, Mr. Chairman.

Chairman HALL. All right.

Mr. LUJAN. So if that is the case, I don't understand why we are not trying to learn what we have done in the past. If there is going to be support across the aisle to work together, which was done after the oil embargos in the '70s to say what can we do to increase production but make sure that we keep it in the United States for American consumption to truly help us here, why that is just not even put on the table any longer? And I guess that is something I can't get my hands around.

Dr. FOSS. Congressman, if I could I think I have some ideas that might help you understand the issues. The places in the United States where we have the cheapest fuel prices right now are where the new sources of production are located. You can look at——

Mr. LUJAN. So this——

Dr. FOSS. —this—you can look at——

Mr. LUJAN. Dr. Foss, if I may——

Dr. FOSS. Let me finish, please.

Mr. LUJAN. No, Dr. Foss, this is my line of questioning here. So do you support keeping increased production in the United States and not exporting it?

Dr. FOSS. No, I don't.

Mr. LUJAN. Okay——

Dr. FOSS. What I was going to distinguish was——

Mr. LUJAN. Well, I appreciate that but my line of questioning is quick here. So—but I do have an area where I think that there is a silver lining for us and we talked about this in the Natural Resources Committee as well. This is something that the Chamber I believe supports as well and I think that there may be support across the panelists. There is a piece of legislation that was authored in the previous Congress that has been reintroduced in this

Congress. And we talk about using natural gas. Natural gas in New Mexico right now, we know production is down because of where the price is. There is a piece of legislation that would actually encourage natural gas use in 18-wheelers. So as we talk about moving the largest vehicles across the country, using a domestic resource, keeping the dollars in the United States, there is a piece of legislation ready to go and I hope that there is a way that we can work together to get our leadership to get this bill moving.

Lastly, I will say is that, you know, with all this pushback against biofuels and making investments in other sources of energy, 80 percent of convoys in Iraq and Afghanistan are for fuel and it is estimated that 46 convoys resulted in a casualty. From 2003 to 2007 we lost 30—we lost 3,000 uniformed and civilian contractors. Something has got to change.

Thank you, Mr. Chairman.

Chairman HALL. I interrupted you and cost you about 30 seconds. Would you like to have 30 seconds back to give Dr. Foss a chance to answer as you asked?

Mr. LUJAN. Mr. Chairman, I think what I will do is I will just put some questions in writing there and I will get them to the witnesses.

Chairman HALL. Okay. You have that right.

The Chair now recognizes Mr. Rohrabacher, gentleman from California.

Mr. ROHRABACHER. And, Mr. Chairman, just for the record, I think the—our colleague did have a point that he does have a right to control those five minutes any way we sees fit and just would—with due respect, I think that that is something that—he did point out that quite often I will question a witness and demand an answer and interrupt if they are trying to elongate the answer. So—but I do that with respect and I know you are just trying to make sure we get all the information out. Sometimes the rules are contradictory to that but sometimes they are meant to keep things fair.

Let me just note here that if the gentleman's point is that new energy—if we keep it here rather than let it go into the world market that that will create lower prices here, why is he stopping with oil? What about food? Why don't we just say any agriculture products that are made in the United States can only be sold in the United States? Well, think of how low the price of food would go or anything else that we manufacture. The reason we don't do that is because it creates other barriers that will hurt our economy and put other people out of work and hurt the overall prosperity of our country because it is more than just a one-step process. But we do know if you increase the supply of something, usually that means that the prices—that the pressure for higher prices go down.

Let me note—and correct me if I am wrong, Mr. Weiss, how many oil refineries have we built in this country in the last 3 decades?

Mr. WEISS. Oil refinery capacity has increased dramatically in the last 3 decades.

Mr. ROHRABACHER. How many new oil refineries?

Mr. WEISS. None, but we have expanded——

Mr. ROHRABACHER. None. That is a good answer. Thank you. And I will follow my colleague's lead. Yes, we have built none.

Mr. WEISS. We have expanded capacity.

Mr. ROHRABACHER. No new refineries have been built. Luckily, our—the people who run our refineries now are trying their very best to keep up with technology.

Let me ask, I have heard some really incredible analyses of how much oil we—and gas we have in this country but also I hear something which seems contradictory to that from Mr. Brown. Ms. Harbert, the predictions you said about how much oil and gas we have, was that including the predictions from shale oil? And Mr. Brown suggested that we don't really have the technology now to get that.

Ms. HARBERT. The specific figure that I referenced, which is 2.7 trillion barrels, that is in-place oil shale and oil sands——

Mr. ROHRABACHER. Um-hum.

Ms. HARBERT. —important to note that 80 percent of those resources however, are on federal lands, not private lands.

Mr. ROHRABACHER. Right.

Ms. HARBERT. In order to develop those, the Federal Government has to allow access.

Mr. ROHRABACHER. Now, I am just thinking about the technology now. Do we have the technology to get that shale oil?

Mr. SLAUGHTER. We are working on the technology. Shell has had a project—a research project going for ten years or so. It is a very long process to make that technology work.

Mr. ROHRABACHER. Does that mean no?

Mr. SLAUGHTER. It means we need to work on it——

Mr. ROHRABACHER. I know but——

Mr. SLAUGHTER. —and it is the same basis.

Mr. ROHRABACHER. —we don't have it now.

Mr. SLAUGHTER. We do not produce commercial oil shale today, no.

Mr. ROHRABACHER. Okay. So——

Ms. HARBERT. But in order for those investments to continue and to grow, there has to be some certainty that ultimately they are going to be able to produce this resource in the United States——

Mr. ROHRABACHER. Okay, but——

Ms. HARBERT. —and right now, that is one of the——

Mr. ROHRABACHER. Well, we didn't know how we would get a lot of gas before fracking came up. We didn't know how we were going to get a lot of the oil, so we would hope the technology was there, but I am just trying to get right now how much reserves we can actually count on.

Mr. Brown, there is—I read an article somewhere that suggested that there was a new method of fracking that was not going to be using water, that would be using some sort of explosives, a fuel of some kind. Do you know anything about that? Could you enlighten me to that?

Mr. BROWN. There is a technology out there called GASFRAC——

Mr. ROHRABACHER. Um-hum.

Mr. BROWN. —and they actually use—they—you can use any propane—or any hydrocarbon product. I think the one they are cur-

rently using is propane. So instead of using water, you use propane to move your materials.

Mr. ROHRABACHER. Okay. And that would make it less likely to have water pollution? Why would someone use that?

Mr. BROWN. Part of the issues we have—like with this Bakken shale—not so much in the Bakken shale but some of the other formations that we are looking at you have in the porous space in the rock you have some clay particles in there similar to bentonite that would swell up when they are contacted with water, which is what we currently use for fracking——

Mr. ROHRABACHER. Um-hum.

Mr. BROWN. —so you try to frack them with something other than water.

Mr. ROHRABACHER. So that would make it more efficient.

Mr. BROWN. Yes. Yeah.

Mr. ROHRABACHER. So I have no doubt that we are going to have technological advances that will increase our ability to obtain this type of fuel and energy for our country as long as the—our government has the purpose and it is the purpose of government to increase the amount of energy in our country and I would suggest that it is the purpose of this government not to increase oil and gas production out of some unfortunate loyalty to this idea that CO_2 is creating huge changes in our climate which will result in the fact that we are not going to develop those energy sources.

Thank you very much, Mr. Chairman.

Chairman HALL. The gentleman yields back. Thank you.

Recognize Mr. Quayle, gentleman from Arizona, for five minutes.

Mr. QUAYLE. Thank you, Mr. Chairman.

Mr. Brown, the President routinely has been claiming recently that under his Administration America is producing more oil today than at any time in the last eight years. This is a few years after the fact the President actually said during an editorial board meeting—I believe it was in San Francisco—that under his Administration energy prices would necessarily skyrocket. And Secretary Chu I believe has been quoted as saying that he would like to see gas prices in the United States to be at European levels. So I think that that kind of shows where the Administration is.

But even though he is trying to say all this, the reality is that most of the domestic production has occurred on state and private lands, not federal land, which the Administration actually has. And I believe Ms. Harbert said that in her testimony that the data shows that oil production on federal lands declined by 11 percent and natural gas production on federal lands declined by 27 percent in 2009 to 2011.

Now, in Arizona where I am from and in many of the Western States, much of our land is federal. It is under federal control. And I really—routinely hear from companies with renewable energy and also traditional energy that they are extraordinarily frustrated by the permitting problems and the administrative roadblocks that are put up when people are trying to get projects on federal lands. And in your testimony you said that "it is fortunate that Bakken exists in North Dakota because most of the surface and mineral ownership is by private individuals with minimal federal ownerships." Could you expand on this because this is the big thing that

we have been hearing over and over again is that, wow, oil and natural gas production is going up and this is because the Administration's actions when in actuality it is in spite of the Administration's actions because most of this has been developed on state and private land. So could you expand on what you are talking about with the Bakken field?

Mr. BROWN. Sure. One of the projects that we are developing in North Dakota is an area or a prospect we call Pronghorn. It is located in Stark County, North Dakota, and that project butts right up against the Theodore Roosevelt National Park up there. The park is off limits. We can't drill in the park; we can't even drill under the park so that is totally off limits. There is a halo of federal acreage around the park that is administered by the BLM. We are able to get drilling permits in North Dakota from—on state and on fee ground in something around 60 days. On the acreage or the leases that we have that are federal, the current—and this is their number; this isn't our number—the current number is 298 days to get a permit.

As I mentioned in my testimony, we currently have 19 drilling rigs running in North Dakota and trying to make—trying to get the logistics to all this to work, when you—you know, you are saying—when you start in they are going—they are saying a permit may take 6 months to get. You plan on 6 months. The 6 months gets there, you don't have a permit, but you have got a drilling rig you have got to do something with. So it has just been—it adds another level of complexity, another level that we have to take into our planning right now. The other—I mean—so that—you know, we are waiting almost a year to go drill a well. We are waiting almost a year to start paying royalties that would be going to the Federal Government.

The other issue we have is there are leases within the area that we are drilling that we have nominated to come up on the lease schedule that just isn't occurring. And so we are not able to drill federal—or fee minerals that surround this particular federal lease just because we can't get access to that federal lease that may exist right in the middle of one of our spacing units.

Mr. QUAYLE. And when you say it was 296 or 298——

Mr. BROWN. Two hundred and ninety-eight.

Mr. QUAYLE. Two hundred and ninety-eight days. Is that on the low end? That is a low-end estimate and usually it is longer than that or——

Mr. BROWN. Well, that is their average over—I think it was the last 9 months or something like that. That was—when—Mr. Salazar went to North Dakota a couple of weeks ago. That was the number that they put out in the print to BLM.

Mr. QUAYLE. Okay. Dr. Foss, a recent report by Citigroup declared that North America is the new Middle East and that—this is a quote—"the only thing that can stop it is politics." And can you explain some of the hurdles that politics could pose to the timely, safe, and economic recovery of hydrocarbon resources and how our current policies are impacting energy development?

Dr. FOSS. Actually, I was thinking of an example as I was listening to Mr. Brown. We have something like 110 species on the watch list in Texas, endangered species. You probably have some-

thing like that in Arizona. And currently, there are attempts to use the ESA to try to slow down oil and gas development in West Texas. This is of concern to the State because of the impact on oil and gas severance tax receipts and other receipts. The point that we have made is that these same species that are being discussed also impact non-hydrocarbon, nontraditional alternative energy projects, as you have well pointed out because they are in the same places that people want to use the development of those energy technologies.

So I think that the thing to focus on is the constellation of federal policies, the fact that they often are in conflict with each other, there is no one-stop shopping. We created one-stop shopping in the State and other States are trying to do the same thing to at least be able to streamline the process for developers so that they can understand what permits they need to get, what the timeline is going to look like, what their responsibilities are, what they have to do to mitigate any impacts they are creating, and so on. The overall management of the process has to be improved. There is just no doubt about that.

Mr. QUAYLE. Thank you, Mr. Chairman. I yield back.

Chairman HALL. Thank you for yielding back.

Mr. Cravaack from Minnesota for five minutes.

Mr. CRAVAACK. Thank you, Mr. Chairman. I thank the panel for being here today.

A couple questions in regards to—Dr. Foss, can you tell me if—we have all heard about you got to pay your fair share and we have seen that paying your fair share for some of the oil companies if you take a look at, for example, Apple like you said, Johnson & Johnson, McDonald's, for example, they are paying—they get quite a bit of tax credits in relation to what the oil companies get. Now, if the oil companies lost their tax credit, what happens? What happens to the consumer?

Dr. FOSS. Not all of the industry is the same. It is a pretty diverse cluster of companies, large, small, some of them are publicly traded, some of them are privately financed so the impacts would be different. If the standard deductions that businesses get to cover the cost of making investments were removed or if the standard investments for aging equipment and assets, whether it is depletion allowances for, you know, aging oil and gas fields, new oil and gas industry or whether—or its depreciation associated with drilling costs and other expenses, then obviously companies are going to look at their investments in a different way. It will slow down the cycle time. They will move more slowly. They will choose not to make certain investments in certain places. And the likelihood is that we would actually have a reduction in our potential domestic production as a result of that.

Mr. CRAVAACK. So when I go plug in at the pump, gas is going to go up. Are we going to pretty much say that?

Dr. FOSS. It would have a very big impact.

Mr. CRAVAACK. Okay. So now let us talk about—that is gas at the pump. I am going to plug in, average American, who pays the ultimate price for this? The average American is going to pay the ultimate price for the tax if President Obama has his way in re-

gards to eliminating the tax credits that are given to the oil companies.

Okay. Let us take it one step further. When I go into town halls, I ask people, how many people have 401(k)'s? How many people have IRA's? You know, how many people have pension plans? A lot of people have big oil in their pension plans, would you agree? So what is the bottom line going to happen to the pension plans and IRA's and 401(k)'s? Those are probably going to go down as well, would you agree with that?

Dr. FOSS. Well, to the extent that the industry would be perceived to be both more expensive and less valuable, then, yes, it would affect market capitalization and affect holdings of those.

Mr. CRAVAACK. So what the President, then, is proposing is going to affect the average American at the pump and also in their long-term retirement plans in the 401(k)'s, IRA's and their pension plans as well. So it is a negative effect overall for these two things as well.

Now, let us talk another thing. Let us say we start ramping up oil production in the United States, America. Let me ask you this question, Mr. Slaughter. You know, we start ramping up—and also Mr. Brown, too—we start increasing our oil production, we start investing into the infrastructure in the United States. What happens when you do that? What do you also create in the sidelines?

Mr. SLAUGHTER. There is a tremendous amount of associated job creation potential around the oil industry from the service sector, the supply chains, and all the supporting dollars in that. So there is a tremendous effect which spreads through the economy.

Mr. CRAVAACK. Creates jobs, wow, what a concept. I think we are in need of that, aren't we, creating jobs? So—okay. So if we lower—get rid of the tax credits we are going to lower IRA's, 401(k)'s, and people are going to have in their pension plans, we are going to increase the price of gas, but if we start investing in our infrastructure, we will start creating jobs which we need badly in the United States as well.

Now, let me ask you this question. We talked, Mr. Weiss—we said something about supply if the supply isn't affected whatsoever. The Strait of Hormuz goes down. Ms. Foss, can you tell me Strait of Hormuz goes down, Iran becomes potentially a nuclear weapon, Strait of Hormuz goes down, 30 percent of the oil goes through the Strait of Hormuz, we have harassment from pirates going through the Red Sea, lack of supply, what is going to happen to gas?

Dr. FOSS. It will go up.

Mr. CRAVAACK. Gas is going to go up. So therefore, the Strait—so supply going down, gas is definitely going to go up. Now, let me take this one step further. Say we do go into a possible wartime scenario where we possibly have actually a two-theater war concept where both sides, both coasts are—sea lanes are shut down, supply is down. Mr. Brown, can you tell me do we have enough oil in this country to keep the United States running in the present?

Mr. BROWN. We do not.

Mr. CRAVAACK. So therefore, we could consider oil production within the United States of America as a national asset. Would you agree with that statement?

Mr. BROWN. I would, yes.

Mr. CRAVAACK. Okay. Now, it is not too long ago I think we fought a world war, a lot of it initiated because of oil. Would that be a correct statement for Japan?

Mr. BROWN. Yes. Yes.

Mr. CRAVAACK. So now we are figuring out that oil production within the United States is a national asset, will create jobs and creating a tax decrease—our tax credit decrease is going to be negative to our economy and possibly negative to job production as well. Wow. It seems pretty straightforward to me on where we are going here.

So let me ask—Mr. Weiss, let me ask you a quick question. Do you believe that CO_2 is the cause of climate change?

Mr. WEISS. Ninety-eight percent of the scientists who have done research on this in this field have concluded that it is human-caused production of carbon dioxide and other global-warming pollutants that are responsible for global warming.

Mr. CRAVAACK. Let me ask. I only have a couple seconds. Do you think we have more CO_2 in the air than we did in 1976 versus where we are today? Do you think we are more environmentally friendly today than we were in 1976?

Mr. WEISS. Yes, we are more environmentally friendly——

Mr. CRAVAACK. Hugely. Okay, let me——

Mr. WEISS. —but we have more CO_2 in the air than we did in 1976 in the upper atmosphere, yes.

Mr. CRAVAACK. Okay, well, I would debate that because of the—looking at the arctic ice going down, first off, it says that CO_2 follows temperature increase, does not initiate it. Second thing is in 1976 I was in high school. You look around the same generation as I. Do you remember when the big theory was then the polar caps were going to expand so dramatically it was going to tilt the whole world?

Mr. WEISS. There had been not as much research then on that theory as their as has been now on global warming.

Mr. CRAVAACK. I would disagree with you, sir, and looking at the arctic caps today, it has been proven that temperature follows—or CO_2 follows temperature.

And with that, I am over time and I will yield back, sir.

Chairman HALL. The gentleman yields back.

And the very patient lady from Florida is recognized for five minutes.

Mrs. ADAMS. Thank you, Mr. Chairman. A lot of my questions have been answered, but I do want to touch back on something.

Ms. Harbert, I know you answered this earlier but I just want to hear it again because some of these rules, you know, the EPA's numerous proposed regulations such as recently proposed New Source Performance Standards for power plants and Cross State Air Pollutant Rules are very burdensome, especially to States like mine in Florida, as well as forthcoming rules on greenhouse gas emissions at drilling sites and tier three refining standards. What does that mean for our energy use and energy prices?

Ms. HARBERT. Well, the reality is that industry cannot figure out how to navigate this regulatory tsunami. If you look at all of the regulations from EPA from 2011 out to 2014, which is what their

planning horizon is, there are tens—many, many, many, many large-scale regulations that are coming forward and nobody has taken a look at the complete amalgamation of all of these regulations, what the impact would be on GDP, what the real impact is and benefit is to the pollutants they are intended to regulate, and what will affect business. And that is really troubling that we have all of these regulations coming all in a short period of time and nobody can honestly say that we understand what the complete cumulative impact will be.

Mrs. ADAMS. Now, would you say they would affect prices? Because I pulled up to the gas pumps just a couple days ago at home and the car before me must have had a heart attack because on the gas pump it was $81.10. So I can only imagine what my constituent was thinking at the time when they were filling up their gas tank. Would those regulations, a combination of such also add to the cost?

Ms. HARBERT. We certainly need to take a look first at electricity because we are seeing this play out in real time for us as the implementation of these regulations is already underway, plants are shutting down, and the local regulators are trying to figure out how to keep the lights on. There is a big reliability issue and I can tell you the economic impact of having a reliability problem in our grid is significant and very, very frightening for the American economy and the American business community.

On the transportation side of things, I mean these are going to be coming in over the next couple of years and we are going to see the impact. It certainly is going to do nothing to decrease prices.

Mrs. ADAMS. And we have seen what happens if we lose a grid as seen in the Northeast, correct? So——

Ms. HARBERT. Very, very, very big impacts on the economy.

Mrs. ADAMS. Mr. Slaughter, I understand you also work for Shell North America. What is Shell doing to increase energy production in the United States? And also, what challenges has Shell faced such as acquiring necessary production permits from the Department of Interior or the EPA? And how long did it take Shell to acquire a producing permit for the lease in Alaska's Outer Continental Shelf? And is that—how does that compare to historical timelines?

Mr. SLAUGHTER. Well, on the first part of the question, we are investing billions of dollars a year, $3 to $5 billion a year in onshore oil and gas exploration, more in the Gulf of Mexico. We are also investing in other sources of energy like wind power, very big wind power developer. So we have a very robust investment plan because we think the resource is there and we think we can develop it for the long-term.

In terms of the permitting and regulatory experience in Alaska, you have to recognize that these are federal offshore leases which have a ten-year life. We are almost halfway through that ten-year period and we are only now beginning to get the necessary permits in place. So we never anticipated the complexities and difficulties of navigating that regulatory process, which has caused significant risk to that offshore drilling program in Alaska.

Mrs. ADAMS. And how would that compare to historical permitting timelines?

Mr. SLAUGHTER. I would have to research that. I think Alaska is a bit of a special case because offshore developments in Alaska is a new activity.

Mrs. ADAMS. Well, Mr. Brown, we have heard a great deal about the dramatic economic turnaround in North Dakota, you know, that is occurring because of—thanks a lot to the oil production. Can you describe the current economic outlook for your operations in North Dakota and what is the current average salary for your employees? How many people has Whiting hired since the beginning of this boom? And what is your company's short- and medium-term growth potential?

Mr. BROWN. Wow. When we made our first acquisition in North Dakota—and this would have been back just before we went public in 2003—we had zero employees in North Dakota. We are currently at about 270 employees in North Dakota. As I mentioned, we have 270 openings in the country right now, approximately 100 of those are in North Dakota. As you are well aware, you know, there is—in order to get employees up there, we have bought housing, we have bought apartments, we are doing everything we can to make it, you know, hospitable for the folks that we move up there. We moved one gentleman from Shreveport, Louisiana, up there. He is wondering if we moved him to the end of the world.

Our outlook for growth, we are currently spending about $800 million in North Dakota this year. That level will continue to grow next year, and so we are—I mean North Dakota is just a very—one of the foundation blocks for Whiting right now.

Mrs. ADAMS. Average salaries?

Mr. BROWN. Oh, man. I am going to guess. The last time I saw the average salary we were paying up there was approaching $100,000 a year.

Mrs. ADAMS. So this process has been economically good for North Dakota and the United States?

Mr. BROWN. Correct.

Mrs. ADAMS. And it created jobs?

Mr. BROWN. Both direct and indirect. I mentioned all the—you know, we hire—a lot of what we get done up there is through contractors. And so we—it just, you know, dominoes through the economy.

Mrs. ADAMS. And I realize I went over, Mr. Chair, but I would like for Ms.—Dr. Foss, if she would like to finish her response to my colleague when she was talking about distinguishing if that would be appropriate?

Chairman HALL. Without objection, you are recognized.

Dr. FOSS. This is to Congressman Lujan's point you mean? Here is the issue—and this is why the debate around Keystone and other infrastructure—siting infrastructure like that is so important. We have low fuel prices in the middle of the country where supply is abundant. The bulk of the population is in coastal areas. We don't have good ways right now to move supply from the interior of the country where Whiting and other companies like Shell are operating to the points where people are. And without being able to address that problem, then we are not going to be able to provide everyone with more opportunities to have more competitively priced energy.

The other thing I would like to suggest the Committee think about is our own waterways—our own coastal waterways by law we cannot move production in our own waterways that is domestically produced because of restrictions in the Jones Act. I know this is controversial but I did put it in my testimony. I want to go on the record as suggesting that everyone does need to look at that and the constraints that it poses. It is really—it is a shame. I do agree it is a shame to think about exporting our production outside of the country when we could be our own best customers. But we can't get there and that is something that people could think about.

Chairman HALL. All right. The gentlelady yields back. And I thank you for that.

And I certainly do thank all of you. I think we are out of questionnaires and questions completed. And I thank you for your very valuable testimony and the Members for their questions. And this has been a wonderful—I think a wonderful presentation on all five of your parts. And I thank you and I know the Committee thanks you. And these empty chairs here shouldn't have any effect on you because this is all taken down. They will all be given to their committee staffs and they will either read them to the Congressmen or let him read it or her read it themselves. So it is available to them and you have made that possible and I sure do thank you.

The Members might have some additional questions for any of you and we will ask you to respond to those in writing if they submit them to you. The record will remain open for a couple of weeks for additional comments.

At this time, I would like to enter into the record three items—and this is without objection—the Executive Summary of the National Petroleum Council report that Mr. Slaughter has testified on today. That is the first one. Second, an editorial from Investor's Business Daily summarizing the massive amount of U.S. oil resources that we could potentially access. That is number two. Number three, an article from yesterday's E & E News detailing comments made by the Texas Railroad Commission Chairman that lifting regulatory burdens could allow Texas oil production to quadruple to four million barrels per day. Without objection, it is so ordered.

[The information appears in Appendix II.]

Chairman HALL. And at this time, if there are no further inquiries, we are adjourned. And thank you.

[Whereupon, at 12:13 p.m., the Committee was adjourned.]

Appendix I

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Mr. Andrew Slaughter

Questions for the Record for Andrew Slaughter related to the House Science Committee Hearing: *"Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology and Policy Pathways"* held on Tuesday, April 17, at 10:00 a.m

1. In recent weeks, county commissions in Mesa, Garfield, and Rio Blanco County Colorado have passed resolutions criticizing or opposing a proposal from the Bureau of Land Management (BLM) that would reduce the amount of public land available for oil shale research and development. Can you briefly explain the impact of the BLM proposal on oil shale development, and its potential implications for the United States' long term energy outlook?

The potential contribution of oil shale in the US. to domestic oil production is substantial in the long-term. The oil in place in Colorado, Utah and Wyoming is estimated at 1.5 trillion barrels of which over half may be recoverable with appropriate technology development. However, such technologies may take decades of sustained research, experimentation and capital commitment for the resource to be developed and large-scale, economic and environmentally responsible operation can lead to large-scale production. Such a sustained effort will require long-term commitments from companies and a supportive fiscal, leasing, access and research regime from the U.S. government.

History has shown in many instances that the most effective arena for technology development is in the field, with the ultimate prospect of commercial operations. Restrictions on access inevitably result in restrictions on technology development as companies have both less opportunity and less incentive to work on and improve the technologies which could unlock large-scale production in the long-term. Federal leases are clearly a necessary and important part of opening and maintaining access to oil shale resources, since federal lands in the Rocky Mountain States where huge resources exist are extensive. The Research, Development and Demonstration (R, D&D) leases that were awarded by the BLM in 2006, represented a positive signal to industry that this resource is important to long-term national energy security and that the government recognizes the importance of sustained long-term applied technology development in the field to ultimate success.

However, the industry is not encouraged by the lack of follow-up leasing programmes since 2006, and by proposals to cut back land available for leasing. The imposition of more restrictions on RD&D land access can be expected to slow progress on effective and environmentally appropriate technologies and potentially put at risk major contributions to new oil supply when it is needed in 20 or 30 years time.

The approach of the U.S. to this resource can be contrasted with that of Jordan, where the government has made available large land areas for oil shale research, in the expectation that the country can become an important oil producer when the technologies have been proved. We can also contrast it with the U.S. government maintaining a research effort into another large-scale future hydrocarbon resource, methane hydrates, for which ultimate success will also depend on long-term, field-based technology trials.

In summary, long-term availability of the huge oil resource and large-scale production potential represented by oil shale can be enabled by leasing of federal lands in the resource-rich areas; and will be impeded and delayed by restrictions on such leases.

Responses by Ms. Karen Harbert

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

Questions for the Record
The Honorable Ralph Hall

Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology and Policy Pathways

Tuesday, April 17, 2012
10:00 a.m. -12:00 p.m.
2318 Rayburn House Office Building

Ms. Harbert

1. A recent article in *Oil and Gas Journal* warned that "transportation hurdles potentially could slow down tight oil development," and further elaborated on challenges that producers could face in transporting crude to refineries. Is this an assessment you would agree with? Can you elaborate on the current state of infrastructure serving new unconventional plays, and identify any issues now or in the future with adequate infrastructure to handle the oil boom?

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

Questions for the Record
The Honorable Randy Neugebauer

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Tuesday, April 17, 2012
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Ms. Harbert

1. What are the dangers of releasing crude oil from the Strategic Petroleum Reserve absent a real, significant disruption in supply? It is my understanding that we have still not replaced the 30 million barrels of reserves that the Administration released in 2011; what do you believe the total cost to the taxpayer will ultimately be when the reserves are replaced, presumably at a higher cost of crude than when they were sold last year?

   If you could prioritize the top three items that the federal government could do, or stop doing, to encourage greater access to affordable, reliable energy, what would it be?

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

Questions for the Record
The Honorable Randy Hultgren

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Tuesday, April 17, 2012
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Ms. Harbert

1. To what degree do you think that the use of hydraulic fracturing has been responsible for the growth in job creation we have seen in the oil and gas industry in the past few years? What kind of job growth do you expect to see in the next decade?

2. What kind of an impact will proposed federal regulations have on this job growth? For instance, the EPA is working on a rule that would require companies to apply for a permit for hydraulic fracturing if they plan to use diesel-like substances in the fracturing fluid. Exactly what constitutes diesel fuel is still being worked out, but the EPA is hoping to expand the definition beyond the traditional scope. What kind of impact would this additional layer of regulation have on development and job creation?

Responses by Dr. Michelle Michot Foss

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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The Honorable Ralph Hall

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Dr. Foss

1. Recently, there have been allegations in the media that oil companies are responsible for fixing the price of oil somehow. For example, Mr. Weiss authored articles supporting this hypothesis. Do you believe it is possible for the "Big Five" oil companies to fix the price of crude oil?

It is highly unlikely that in our large, global, liquid oil marketplace, overt price fixing could occur unnoticed and without reactions. I will not say impossible – it could be that a market participant might, for a very short period of time, influence oil price one way or another by virtue of trading positions. Market manipulation in traded commodities is very difficult to achieve and, more importantly, to sustain long enough for such positioning to be profitable. Note my caveat regarding profitability – in all of the documented cases of attempted commodities market manipulation that I know of, trading losses were the outcome. "Loss aversion" being a widespread hallmark of investor behavior, even among the most sophisticated investors, the downside risk of overt market manipulation and price fixing provides a strong disincentive to such strategies.

We believe, based on extensive review of literature and analysis and our own depth of knowledge about the structure and performance of oil and other commodities markets, that oil price movements are largely the consequence of a number of factors that can be identified and understood, but difficult to test given lack of data and transparency. One key oil price driver is the inherent structure of the global crude oil market, dominated by producing and exporting countries that impact prices via production quotas. These countries have target prices that reflect the cost of political stabilization. Throughout the "Arab Spring" and as events have unfolded since then, producing/exporting countries have used revenues from oil export sales to mollify restive populations. A second key driver has been the dominance of large consuming emerging

markets – China and India in particular. India actively subsidizes the cost of petroleum products to politically powerful customers, sheltering them from higher prices and thus exacerbating global demand at a time when demand should be more price sensitive. Third, the cost of supply is a central factor. Both real and subsidized demand and consequent high prices have triggered large capital investments in ever more expensive frontier oil plays, such as offshore in deeper water and complex unconventional resource projects. Higher oil prices also make the costs of inputs to oil exploration and production, such as steel, much more expensive. Fourth, commodities are treated as an asset class in investment portfolios. The base of commodities market participants has broadened considerably over the years, and we now have a large population of investors providing crucial financial liquidity but who also do not have physical assets and thus are invested in futures contracts simply for financial gains. This trend is a distinct consequence of U.S. fiscal and monetary policy. The performance of alternative investments such as stocks and bonds has been uneven and lackluster, discouraging many investors from holding these assets. A particular problem is that for many years – since the late 1990s – interest rates have held down in order to support economic growth and recovery through myriad events, ranging from the 1990s "dotcom" bubble and bust, to 9/11 and housing (first to encourage mortgage lending and then to recover from the broad recession in which we have been mired since 2009). Oil is traded in dollars; low interest rates impact the value of the dollar; a cheaper dollar has contributed to the long upward trajectory of our main, light sweet crude benchmark.

Finally, other behaviors – unplanned, unexpected, and unpredictable – can "accelerate" price movements that may already be underway because of shifting fundamentals. We think "herding" can and does occur. That is, market participants will pile into traded contracts in hopes of benefitting from price appreciation (non-commercial participants mainly engage when prices are

rising; most of these investors are not sophisticated enough to engage successfully in "short" positions). Behavior of non-commercial market participants at times can be so prominent as to cause the traded price to "de-link" from core, supply-demand fundamentals. Indeed, the increasing popularity of commodities for investment portfolios and demand for futures (growth of the "paper" market) caused us to suggest, in 2009, that the physical and financial markets for crude oil and other traded commodities were both separate yet highly linked (see http://www.beg.utexas.edu/energyecon/thinkcorner/Energy_Trading_Foss.pdf). Based on that work we were asked to provide an expert review on oil markets for the U.S. Energy Information Administration. A summary of our findings, the basis for my response, can be found at http://www.beg.utexas.edu/energyecon/thinkcorner/Think%20Corner%20factors%20impacting%20oil%20price.pdf.

2. In your testimony you speak to the importance of sustaining a robust resource base as essential to restoring market balance. Can you explain what you mean by market balance, and what role a robust resource base can serve in mitigating swings in price? What role can unconventional oil resources play in maintain this resource base, and what steps need to be taken now to ensure the continual development of these resources?

By market balance I mean the balance between supply of crude oil and liquids relative to demand at any point in time. Market imbalances result in price signals that send crucial information to participants. Given the persistently high oil prices since 2003, oil companies have been motivated to prove up new frontier plays, especially in deep water and tight oil onshore. Expanding the known resource base does not alleviate all problems in a high price cycle – witness the ongoing difficulties in building out supporting transportation and other midstream infrastructure for new domestic oil supplies. However, establishing new domestic resources that can be converted to reserves and ultimately production provides a supply inventory that can be brought into the marketplace much more quickly. Market dynamics are heavily influenced by expectations about supply-demand balances and price. When expectations are that balances are tight and new production not easily forthcoming (2005-2008) then prices tend to be much higher and more volatile than they if the opposite were true. I emphasize that while prices trended back up in 2008, the general forward curve has flattened out considerably (see chart above). This is because sentiment has shifted – we expect supply to be more available and more easily delivered heading into the future. In addition, it is very clear from OPEC communications, trade press, and good market intelligence that the major oil producers and exporters also share these expectations and are motivated to dampen prices in order to stem further erosion of oil demand in the U.S. and elsewhere. Oil market psychology is everything!

3. During the hearing, you gave an example of a potential hurdle politics could pose to the timely development of our nation's energy resources. Please elaborate on the example you gave of endangered species listings in Texas and the impact that might have on production, and provide any other pertinent examples of impending or proposed policies that could negatively impact production.

I have many concerns, not least of which is timely build out of transportation and midstream infrastructure to efficiently, and cost effectively, transport, treat, store, and deliver oil supplies from new geographies in the Lower 48. At the time of the hearing, there was great concern that the Dunes Sagebrush Lizard would be listed under ESA for protection. The petition to list DSL was withdrawn; see http://www.fws.gov/southwest/es/Documents/R2ES/NR_for_DSL_Final_Determination_13June2012.pdf . Species that are are on the watch list with are shown on the Texas Comptroller of Public Accounts web site at http://texasahead.org/texasfirst/species/watch.php. Counties in the Permian and Delaware basins of West Texas and the Eagle Ford trend in south/southwest Texas are affected. However, all counties in Texas are affected by ESA watch lists to some extent.

4. A recent article in *Oil and Gas Journal* warned that "transportation hurdles potentially could slow down tight oil development," and further elaborated on challenges that producers could face in transporting crude to refineries. Is this an assessment you would agree with? Can you elaborate on the current state of infrastructure serving new unconventional plays, and identify any issues now or in the future with adequate infrastructure to handle the oil boom?

Yes. It is a slow process building out infrastructure – time required for permitting new pipelines, in particular, creates delays. This is true for oil, gas, and natural gas liquids in the unconventional plays. For natural gas, the primary problem is the low price environment and the lack of basis differentials (differences in prices across locations along with lack of seasonal variation) that normally attract new investment by signaling imbalances. We are in a slack market with surplus deliverability. In all likelihood, and as in the past, upward pressure on natural gas price may well derive from transportation bottlenecks. For NGLs, investment requirements are substantial, including new downstream petrochemicals offtake. These are high risk investments and companies are moving slowly to conduct due diligence. Oil is more fungible and so alternative transportation options exist – mainly rail, which is enabling shipment of oil from North Dakota and providing a bit of relief to railroads plagued by poor business conditions as coal production and use have declined. The Keystone XL Pipeline debate highlighted the strong conflicts and mixed opinions associated with siting new pipelines. A streamlined, state-federal cooperative approach on environmental reviews and siting could help, with improved, and more constructive, public engagement.

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

Questions for the Record
The Honorable Randy Neugebauer

Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology and Policy Pathways

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Dr. Foss

1. What are the dangers of releasing crude oil from the Strategic Petroleum Reserve absent a real, significant disruption in supply? It is my understanding that we have still not replaced the 30 million barrels of reserves that the Administration released in 2011; what do you believe the total cost to the taxpayer will ultimately be when the reserves are replaced, presumably at a higher cost of crude than when they were sold last year?

The problems with government-controlled strategic reserves are many-fold. First, governments rarely can get it right when it comes to releases. There have been times over the past 15 years or so when releases were raised as a possibility to calm markets (example – Spencer Abraham during the first Bush administration and Gulf War) but refiners could not take additional supplies. Or, more often, eventual releases happen at the wrong side of the price event. Second, as you point out in your question, the problem is paying for replacement. This is a charge to taxpayers that is an unnecessary burden. If strategic reserves are felt to be essential (at minimum, to meet our IEA commitments if we feel these need to be honored) then they should be true national security reserves and part of DOD's budget rather than managed as a loosely defined and poorly functioning market implement. Finally, most controversially, prevailing perceptions of SPR is that they are too often managed for political rather than market gain. This undermines the entire purpose of releasing strategic reserves – market psychology becomes affected by political factors and the release, or threat of release, triggers adverse reactions.

I can't even estimate what the total cost to taxpayers of replacement would be. That estimate goes well beyond the dollars per barrel of domestic/world market prices. It has to include the opportunity cost of not being able to use those federal funds for other essential needs.

If you could prioritize the top three items that the federal government could do, or stop doing, to encourage greater access to affordable, reliable energy, what would it be?

One – streamline environmental rules and reviews. Create a "one-stop" process for Federal lands and right of way. Strengthen FERC's "team" approach of federal-state coordination and use that across agencies. Get the EPA to "get real" – if that Agency is to have involvement in how energy development proceeds, then there should be tangible experience at EPA when it comes to energy resources, infrastructure, and operations. EPA "independence" for environmental protections absent practical energy sector needs is disadvantageous to energy consumers and customers and ultimately a waste of resources – emphasis gets placed on environmental protection initiatives that offer, at best, minimal or even diminishing returns in terms of real improvements and/or mitigation. Delays in siting, permitting, enabling energy resource and infrastructure development to proceed translate into higher costs for energy customers and consumers and erosion of national energy and economic security.

Two – put authority where it belongs. Why does State have control over Keystone, for instance? Federal authority is fragmented, unwieldy, duplicative, and inefficient. Laws and rules should be re-visited and revised to eliminate redundancies, improve reviews, and improve oversight and enforcement. This should happen across the board for all dimensions of federal oversight when it comes to energy resources and infrastructure – environment, labor, safety, economic (tariffs, etc), and so on.

Three – good, timely, transparent data and information are vital and essential for planning and decision making. EIA has done yeoman's work to improve data collection and access. More needs to be done. But, more importantly, all federal data should be centralized and consolidated to force interactions across data collecting bodies (EIA, BLS, BEA, etc.). This is a strategic issue and need beyond energy. More cooperation is needed across the key data collecting agencies. EIA has invested in and provides an effective data portal that could be adapted for use for other federal, and perhaps even state, economic and energy information streams. Indeed, more cooperation is needed between state and federal agencies for data collection and to resolve persistent conflicts and inconsistencies in data quality. Decision makers, customers, policy makers would all benefit from the ability to compile decent, reasonable, and, most important, timely views of industry and market conditions especially during periods of stress, such as recessions, national security events, and the like.

2. Could you briefly touch on the economic benefits that Texas has recently enjoyed by enacting energy-friendly policies on the state level, and how that could be applied to other states and the federal government?

To my point above about sensible one-stop shopping for federal data, I personally have spent inordinate amounts of time trying to locate and consolidate data that could help address economic benefits associated with energy development and implications of state and federal policies. This is an exercise fraught with difficulty and full of frustration, and it shouldn't be the case. We know roughly how policy and regulatory regimes in Texas enhance energy production

and use and the consequences. For instance, streamlined one-stop shop permitting for drilling new wells in Texas, initiated by the Texas Railroad Commission some years ago and in cooperation with other state agencies such as Texas Commission on Environmental Quality and the Texas Water Development Board allows producers to much more quickly test and prove up new plays. Our ability to sustain oil and gas production in Texas shows up in the bottom line of production taxes collected by the Texas Comptroller of Public Accounts; the state's ability to sustain revenue flows as fields mature and new opportunities are pursued provides an indication of both attractive investment conditions and the state's ability to be flexible through industry cycles. We also know that time horizons for approving, constructing, and initiating operations of new electric power plants is shorter in Texas than other large states; that we have been able to sustain a large and mobile industry workforce with commensurate economic benefits and a healthy capacity to create jobs and absorb slack in our workforce during downturns.

Translating the Texas experience to other states and the federal domain could be difficult; other jurisdictions may be less able or willing to make certain tradeoffs. We have been, at times, fairly critiqued for placing less attention than we should to environmental quality and protection. However, by creating a business-friendly approach and gaining economic benefits from that approach, we have wealthier communities that are better able to invest in their own amenities and priorities.

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

Questions for the Record
The Honorable Randy Hultgren

Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology and Policy Pathways

Tuesday, April 17, 2012
10:00 a.m. -12:00 p.m.
2318 Rayburn House Office Building

Dr. Foss

1. To what degree do you think that the use of hydraulic fracturing has been responsible for the growth in job creation we have seen in the oil and gas industry in the past few years? What kind of job growth do you expect to see in the next decade?

Hydraulic fracturing is merely a means to an end. It happens to be a best available technology, based on decades of use, for well construction in certain kinds of "plays" and locations. As such, hydraulic fracturing has helped the U.S. oil and gas industry to sustain itself, creating jobs and economic benefits, for a very long time.

Since the mid-1990s, hydraulic fracturing has been adapted for unconventional resource plays, combining multiple stages of fracturing across lateral (horizontal) well bores. This approach has made it commercially feasible to capture hydrocarbons from formations that are very rich in organic material but that also are deep and very tight (that is, the rock matrix has little porosity and little permeability making extraction almost impossible without accommodating technology). Pursuit of unconventional resource plays with lateral multi-stage hydraulic fracturing as a key enabling technology has opened new opportunities for growth in domestic oil and gas production. To be fair, however, these same jobs and associated income, tax, and other economic benefits could be derived from investment in conventional oil and gas reservoirs and resources, for which hydraulic fracturing also may be needed to some extent (especially to recover additional resources from older fields or to improve recoveries from vertical wells). The attraction of unconventional resource plays (or resource plays for brevity) is the avoidance of exploration risk, i.e., the chance that hydrocarbons are not present, and thus higher costs and potential losses associated with unsuccessful wells. Shales are hydrocarbon source rocks for conventional reservoirs; indeed, the best place to hunt for natural gas in shales or liquids from silt lenses in shales is underneath existing oil and gas fields. All of this does not mean that all unconventional oil and gas wells are successful – uncertainty, the amount of liquids and/or

natural gas that can be recovered, can be substantial. Distribution of hydrocarbons and recovery rates – industry's ability to extract hydrocarbons from these very tight rocks – are very uneven both across and within basins.

Because of uncertainty about volumes of oil and gas that can be recovered from challenging resource plays into the future, building outlooks for job growth are very difficult. In addition, "above ground" factors (public opposition; regulatory requirements and compliance; oil and natural gas prices and price signals; development of essential midstream infrastructure – pipelines, storage, terminals, processing, and so on; and demand – availability of, or growth in, available markets for U.S. production or viable export strategies) will impact heavily on industry prospects and performance. If conditions remain favorable, job growth prospects in states and locations where production can be established will be favorable (4 to 6 percent or more would not be surprising).

Responses by Mr. James Brown

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY

Questions for the Record
The Honorable Ralph Hall

Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology and Policy Pathways

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Mr. Brown

Question 1:

In recent weeks, county commissions in Mesa, Garfield, and Rio Blanco County, Colorado have passed resolutions criticizing or opposing a proposal from the Bureau of Land Management (BLM) that would reduce the amount of public land available for oil shale research and development. Can you briefly explain the impact of the BLM proposal on oil shale development, and its potential implications for the United States' long term energy Outlook?

Answer:

In Wyoming, Colorado and Utah we have a huge resource in oil shale [get some numbers]. The oil shale deposits range anywhere from being at the surface to several thousand feet below the surface. In the past there have been many attempts at methods to economically recover the liquid locked in these rocks. We have had discussions with the operators of a plant in Russia where similar deposits exist and they mine it. Because of environmental concerns that is probably not an option.

There is going to have to be a technology break-through to make the production of hydrocarbons from the oil shale economic. Because of the relative shallow depth of the deposit there are environmental concerns such as protection of ground water and surface environment. If we limit the number of places where individuals / corporations are allowed to explore and apply research to this resource we may delay the technology that would eventually make this an economic source.

Question 2:

Your testimony highlights how advances in technology have enabled greater exploration and production of domestic energy resources. Can you please describe this in further detail? How does Whiting Petroleum decide to invest in technology development?

a. **What do you consider the biggest opportunity associated with the advancement of new technologies?**
b. **What can the Federal Government due (sic) to encourage greater research and development in technologies to expand domestic energy supply?**

Answer:

As an industry we have known there was oil in the Bakken since the 1950's. With the advent of horizontal drilling and the staged hydraulic fracturing, first utilized in unconventional natural gas production, we were able economically to recover oil from the Bakken in North Dakota. From the Bakken, industry has moved on to the Niobrara in Colorado and Wyoming, the Marcellus in Ohio, Pennsylvania and New York, the Wolfcamp in the Permian Basin of Texas and New Mexico. Each of these plays is different and takes a slight modification to the technology to be successful. As an industry we have knowledge of numerous tight hydrocarbon bearing formations in the Lower Forty-Eight and around the globe and we now have a new tool in the tool box to use to explore for these reserves.

One could say we invest in technology every day. What is considered routine today, for example a 30 stage sliding sleeve hydraulic stimulation in a horizontal wellbore, could not have been performed three years ago. There are several areas where we are doing "firsts" which are pushing the technology. How the decision is made concerning when Whiting makes the decision to invest directly in a technology, say our two electron microscopes we have in our rock lab in Denver is a bit more involved. As we continued to complete wells in the Bakken and Three Forks in North Dakota and our knowledge of "unconventional oil" production increased we encountered things we did not understand. We were doing things that conventional thinking would indicate were not possible. So we start looking for explanations and for information. When we reach a point where there is no organization providing the information or providing the answers we are after we have to determine the value associated with that particular bit of information and does knowing it provide us with an advantage over our competitors.

What can the government do to help with research and development? First of all take a balanced approach to the research on potential energy resources. It is no secret the current administration does not support any fossil fuel as a resource, and all of the attention is directed towards renewable / sustainable energy, solar, wind and bio-mass. As a society we are going to have to utilize all of the energy sources we can imagine. However we cannot make this transition overnight it is going to take time to develop economic solutions to the energy issue. Energy security is an important issue and the Federal Government has the means to assist with the research required to perform some of the long-term background research that is required to develop some of the unconventional resources.

Question 3:

In your testimony, you state it is "fortunate the Bakken exists in North Dakota" because most of the surface and mineral ownership is by private individuals, with minimal Federal ownership. What are the obstacles to drilling on Federal lands? Is there a difference in leasing, permitting and drilling timelines?

Answer:

Yes, there is a huge difference in leasing, permitting and drilling on fee or for that matter State lands and on Federal lands. First, acquiring the lease. With a fee lease, county records are researched to find who owns the minerals, the mineral owner is contacted a lease negotiated, executed and that is the process. This can happen in a matter of days to several weeks. On Federal acreage the lease has to first be nominated by someone who wants to lease the minerals. The responsible regulatory agency reviews the lease to determine if there are any factors that would prevent the lease from being offered in a Federal lease sale. This agency also determines what lease stipulations, if any, should encumber the lease (no surface occupancy, wildlife, etc.). Once this review is complete the lease is placed on an upcoming lease sale. This process can take from months to years. We have nominated leases years ago and they have not yet shown up on a Federal lease sale.

Once the lease makes it through the nomination process it is auctioned to the highest bidder at a Federal Lease sale and a winning bidder determined. Prior to the lease being issued, the winning bidder pays the lease bonus which could amount to millions of dollars. This is another step in the process where delays occur. The BLM went for over two years in Wyoming without issuing leases to the winning bidders. This is also the point where the lease can be contested by parties who have no financial stake in the process and prevent the lease from being issued. This entire process can take anywhere from months to years.

Once the lease is issued and the operator wants to shoot seismic to help identify where the operator wants to drill. For both Federal and fee leases permits are required to shoot seismic. On Fee leases this is a process that can be handled in a time frame measured in weeks and the seismic shoot can be initiated. We are in the process of shooting two seismic programs on Federal leases in Colorado and we have been working on getting all of the permits and clearance for over a year on each project. On the Western Colorado shoot we are permitting to utilize helicopters to distribute the geophones to reduce the environmental impact. We are now being required to perform archeology surveys on the spots where the helicopters are going to land. More boots on the ground is what we were trying to eliminate. Common sense does not seem to be too common.

Drilling permits on fee land are handled by the State agency who have primacy over that particular activity. In most states drilling permits are received and approved in 60 days or less. Currently federal drilling permits in North Dakota are taking 298 days to be approved. The Federal agencies are saying it is because of the operators not providing complete drilling permit applications. Part of the problem is because of staff turnover at the agencies and that a clear definition of what constitutes a complete permit is constantly changing. Industry is diligently working to provide complete permits. It is not in our best interest to provide incomplete permits.

I could go on with other issues, I believe it is obvious that yes there is a difference in operating on Federal acreage.

Question #4:

What technology advancements are you aware of that are making the development of unconventional resources safer, cleaner and more efficient?

Answer:

Drilling Rigs. The rigs we are using in North Dakota are much safer and efficient than the rigs that were in service just 10 years ago. Iron roughnecks perform many of the pipe handling chores that were always a safety concern. Automated catwalks simplify moving of the pipe from ground level up to the rig floor. Many of the manual tasks have been automated to make the rig a safer place to work.

Although not required, Whiting has installed closed loop mud systems on all of our rigs in the Williston Basin. This reduces the environmental impact and eliminates the need for pits. Although this is more expensive we feel it is a necessary step.

Today's drilling rig has mud pumps with greater horsepower ratings. This is required to drive the new high torque mud motors that are being used to drill the horizontal wells. It is Whiting's goal that once the wellbore is turned horizontal and casing set through the curve to drill the entire 10,000 foot horizontal section with a single bit and motor run. That is a huge improvement over what was expected just a few years ago.

Whiting has worked closely with Baker Hughes to utilize technology to improve how we drill Bakken wells. As mentioned in the previous paragraph, we drill a vertical hole approximately 10,000 feet to near the top of the Bakken turn the well horizontal and set 7" casing. At that point the rig is about two miles away from the bit. When we finish the horizontal section the rig is about 4 miles away from the bit. What you think is going on downhole may not be what is actually happening. Baker Hughes , working with Whiting has developed tools that monitor downhole conditions to help the drilling engineers optimize the weight on the bit, rotational speed and downhole tool configuration to drill the well in the most efficient method possible.

One other game changer is information flow. With the advent and universal availability of the internet our technical staff has information available at their desks to make them more efficient. We can have a drilling engineer in Denver supervising a rig in North Dakota and applying what he has learned in North Dakota to a drilling operation in West Texas. Likewise, a geologist in Denver can be monitoring and directing the paths of a drill bits on several rigs in North Dakota based on real time data while sitting at their desk in Denver.

Responses by Mr. Daniel Weiss

Center for American Progress Action Fund

May 18, 2012

The Honorable Eddie Bernice Johnson
2468 Rayburn Office Building
Washington, DC 20515

Dear Representative Johnson,

Thank you for the invitation to testify at last month's Science, Space and Technology Committee hearing on "Tapping America's Unconventional Oil Resources for Job Creation and Affordable Domestic Energy: Technology and Policy Pathways." I am honored to be included as a witness on this topic.

Attached please find my responses to your important questions. Please don't hesitate to contact me with any additional questions.

Sincerely,

Daniel J. Weiss
Senior Fellow and Director of Climate Strategy
Center for American Progress Action Fund

1. To what extent can domestic oil insulate consumers from fluctuations in the global price for oil?

The most important contributor to high gasoline prices is high oil prices. The Energy Information Administration estimates that the cost of crude oil was 72 percent of the cost of a gallon of gas in February 2012. The price for a barrel of West Texas Intermediate crude oil was 3 percent higher in March 2012 compared to March 2011. Brent crude oil—a lighter, sweeter oil sold in Europe but often used to produce gasoline on the East Coast—was 9 percent higher compared to a year ago.

Oil prices are set on the global market, which is controlled by the Organization of Petroleum Exporting Countries, a cartel. The Federal Trade Commission found that:

> *Over 70% of the world's proven oil reserves are in Organization of Petroleum Exporting Countries (OPEC) member countries. OPEC attempts to maintain the price of oil by limiting output and assigning quotas. These actions by OPEC would be a criminal price fixing violation of the U.S. antitrust laws if done by private firms.*

This leaves us extremely vulnerable to volatile prices or international events beyond our control.

Because of this global, cartel-controlled market, the president of the United States has little control over oil prices. A March 10 *Wall Street Journal* article noted that,

> *U.S. gasoline prices, like prices throughout the advanced economies, are determined by global market forces. It is hard to see how Mr. Obama's policies can be blamed.*

The Cato Institute, a free-market think tank, came to a similar conclusion in early March:

> *Is President Obama responsible for the spiraling price of gasoline? Republicans say yes, but the facts say no. ... Why have gasoline prices increased since the start of the year? The simplest explanation is that the price of crude oil has increased.*

The Wall Street Journal, Cato Institute, and a survey of economists by the University of Chicago Booth School of Business, all concluded that President Obama's policies cannot affect gasoline prices.

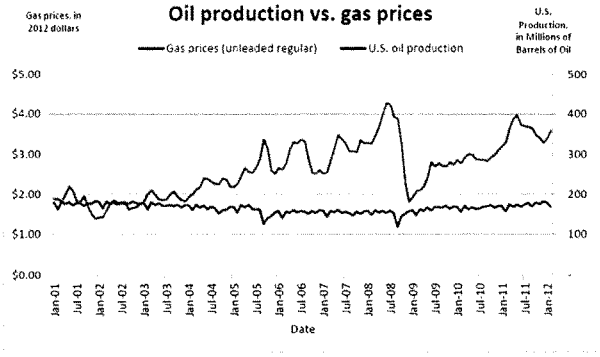
2. Will increased domestic drilling allow the United States to be energy independent?

No. We consume 20 percent of global annual supply but we only have 2 percent worldwide technically recoverable reserves. The ultimate path to long-term relief is to dramatically reduce our reliance on oil. The most effective way to reduce pain at the pump is to reduce our oil use so that we pump less.

3. Will increased domestic drilling bring back the low gasoline prices Americans expect?

To test whether more U.S. drilling would lower gasoline prices, the Associated Press completed an exhaustive analysis of 36 years of monthly U.S. oil production and gasoline price data. AP found that there is:

> *No statistical correlation between how much oil comes out of U.S. wells and the price at the pump. If more domestic oil drilling worked as politicians say, you'd now be paying about $2 a gallon for gasoline. Instead, you're paying the highest prices ever for March.*



Ken Green, a resident scholar with the conservative think tank American Enterprise Institute, explained that crude oil is a global commodity whose price will be unaffected by new U.S. production. In 2011 Greenwire reported that Green said,

> *"The world price is the world price. Even if we were producing 100 percent of our oil," Green said, if prices increase because of a shortage in China or India, "our price would go up to the same thing ... We probably couldn't produce enough to affect the world price of oil," he added. "People don't understand that."*

4. What are the most important things we can do as policymakers to reduce the impact of high gas prices on consumers?

Support investments that reduce oil use. Even as we produce more and use less oil at home, oil prices remain subject to the global market. The 2011 disruption in Libya's oil production sent prices climbing. This year, Iran's saber-rattling to use oil as a weapon to defend its nuclear program roiled markets. This destructive price volatility will continue to harm our economy and Americans if we continue to depend on a product with few substitutes. We consume 20 percent of global annual supply but we only have 2 percent worldwide reserves. The ultimate path to

long-term relief is to dramatically reduce our reliance on oil. The most effective way to reduce pain at the pump is to reduce our oil use so that we pump less.

The United States must develop modern fuel economy standards to make cars go much farther on a gallon of gas. As noted above, the administration will soon finalize fuel economy standards for passenger vehicles manufactured from 2017–2025. If the standards are kept efficient, they will save more than 2 million barrels of oil per day. Congress must resist pleadings of special interests to reduce or delay these standards since these pleas will only increase gasoline consumption and prices.

In addition to much-improved vehicle fuel economy standards, we must begin the investment in cars and trucks powered by other fuels. Passenger vehicles could use readily available, increasingly clean electricity. Plug-in hybrids and all electric vehicles consume little or no gasoline. The Chevrolet Volt and Nissan Leaf are two new electricity-powered vehicles. The Volt was named "2011 Motor Trend Car of the Year." During its first year of production, its combined sales were twice as large as the now-familiar Toyota Prius and Honda Insight hybrids in their first years.

As with cell phones, desktop computers, and other innovative new technologies, there will be bumps along the road to widespread commercialization. For instance, bad publicity for the Volt due to overstated concerns about the potential for fires has inhibited sales. Nonetheless, February 2012 sales were significantly higher than January sales. In March Chevrolet sold more Volts than in any previous month. Despite GM's temporary halt in production so as to sell some existing inventory, it still plans to sell 45,000 Volts in 2012—six times more than last year.

Despite the Volt's recognition as an innovative, impressive vehicle, it has suffered attacks from conservatives, who sound like they are rooting for General Motors to fail, even though this plug-in hybrid technology could dramatically reduce oil use and pain at the pump. These condemnations are equivalent to assaulting the first cell phones, desktop computers, or iPads for being too big, too expensive, or too limited—common concerns with brand new game-changing technologies. Those who criticize the Volt in their attempts to score political points should be ashamed of their attacks on American ingenuity and innovation.

The Volt and other innovative American oil savings technologies require enhanced infrastructure to speed their adoption. There is a long history of government support for the infrastructure that is essential to grow pioneering technologies, from FM radio to telephones. Electric vehicles would likewise benefit from such assistance with recharging infrastructure. The Electric Drive Vehicle Deployment Act of 2011, H.R.1685, sponsored by Reps. Judy Biggert (R-IL) and Ed Markey (D-MA) would provide financial assistance to states for the deployment of electric vehicles.

Investments in buses, subways, and trains can also reduce our dependence on oil and create jobs. Public transportation saves the United States 900,000 automobile fill-ups per day, which equals 4.2 billion gallons of gasoline per year. Every $1 billion of investment in public transportation

infrastructure supports 36,000 jobs in a variety of industries—construction, finance, insurance, real estate, retail, and more.

Despite these overwhelming benefits, our public transportation infrastructure is woefully underfunded. A recent CAP report, "Meeting the Infrastructure Imperative: An Affordable Plan to Put Americans Back to Work Rebuilding Our Nation's Infrastructure," by Donna Cooper found that an additional investment of $15.7 billion annually is needed to meet our most urgent public transportation infrastructure needs. This would also increase oil savings and create jobs.

Additionally, selling some reserve oil could provide temporary relief. . There is a proven tool, however, that can provide some temporary relief from high prices in the short term. Selling a small amount of oil from the Strategic Petroleum Reserve in coordination with sales from International Energy Agency reserves could immediately expand the world oil supplies by millions of barrels over a month or two.

The Strategic Petroleum Reserve is 96 percent full. Selling a small amount of reserve oil in conjunction with our allies—say 45 million barrels each—would still leave the reserve 90 percent full. It's important to note that the 104th Congress under then-Speaker of the House Newt Gingrich sold 28 million barrels of reserve oil in 1996 to reduce the budget deficit when the reserve was less than 80 percent full.

Selling SPR oil can temporarily lower oil and gasoline prices by bursting the "bubble" caused by Wall Street speculators betting that oil prices will continue to rise due to fears of supply disruption in the Persian Gulf. Such a sale has occurred under the past four presidents and has lowered oil and gasoline prices every time. This can cut prices and burst the bubble—even recent rumors of a reserve oil sale reduced prices. On March 15 Bloomberg reported:

> *Oil [prices] fell ... on reports that President Barack Obama discussed a release from the U.S. Strategic Petroleum Reserve with UK Prime Minister David Cameron.*

Another measure that would lower oil and gasoline prices would be to lessen Wall Street speculators' ability to drive up prices. Many experts believe that these speculators—who never intend to take possession of the oil whose contracts they buy—are driving up oil prices to make a quick profit, preying on the fears of commercial end users who attempt to lock in a favorable future price.

5. What role does efficiency and conservation play?

The United States must develop modern fuel economy standards to make cars go much farther on a gallon of gas. As noted above, the administration will soon finalize fuel economy standards for passenger vehicles manufactured from 2017–2025. If the standards are kept efficient, they will save more than 2 million barrels of oil per day. Congress must resist pleadings of special

interests to reduce or delay these standards since these pleas will only increase gasoline consumption and prices.

6. What are some policy proposals that DO NOT show promise for bringing down gas prices or that otherwise have adverse impacts on the economy or the environment?

Another regular proposal to lower gasoline prices is to waive the summer pollution reduction requirements for gasoline in metropolitan areas with severe smog problems. These standards reduce contaminants produced by gasoline combustion such as nitrogen oxides and volatile organic compounds that form ground level ozone (smog) in the presence of sunlight.

The American Lung Association warns that ozone causes "increased risk of premature death," "asthma attacks," and "increased susceptibility" to heart- and lung-related problems. Children, seniors, and those with respiratory ailments are most vulnerable to harm from smog.

According to an EPA analysis, abandoning these cleaner gasoline rules might reduce gasoline costs by only a few cents per gallon but would increase the smog that harms children, seniors, and others. In addition to human suffering, such a step would have real economic costs due to additional health care expenditures and lost worker productivity.

The Congressional Research Service recently concurred that relaxing these clean fuel standards would require other polluters to make steeper, more expensive pollution reductions:

> *Relaxing these standards long-term may require states that use special blends as part of their plan to meet NAAQS [National Ambient Air Quality Standards that protect public health] to come up with alternative—potentially more commercially costly—means to meet air quality targets.*

Some people are calling for more oil drilling in protected places to reduce gasoline prices, but this won't reduce gasoline prices. It takes seven years for new offshore oil drilling to produce any oil. The Energy Information Administration found that opening up the currently protected Atlantic and Pacific coasts won't have an impact on price. The administration also predicts that it will take 10 years to produce oil from the Arctic National Wildlife Refuge in Alaska.

7. What impact would approval of the Keystone pipeline system have on the price of gasoline?

Other oil industry advocates claim that completing the Keystone XL pipeline from Alberta, Canada, to Steele City, Nebraska, would both increase oil supplies and reduce prices. The State Department's analysis of the project found that neither assertion is accurate.

The State Department's final "Keystone XL assessment" concluded that it would not increase oil supply or lower prices:

> *WORLD and ETP studies indicate that building versus not building Keystone XL would not **of itself** have any significant impact on: U.S. total crude runs, total crude and product import levels or costs. [emphasis original]*

The State Department analysis determined that the pipeline would only have a tiny impact on the price of crude and other products:

> *Under the KXL scenario, delivered prices for [oil sands] ... into PADD3 Gulf Coast are lower than under the No KXL case and those for PADD2 [Midwest], higher. The effect is limited, no more than around $0.70/bbl [per barrel].*

This level of reduction translates to roughly a penny and a half per gallon of gasoline.

In addition, the State Department analysis acknowledges that the pipeline would actually raise gasoline prices in the Midwest since it would eliminate the current oil glut there that has kept prices lower. Bloomberg cautions that,

> *TransCanada Corp.'s Keystone XL oil pipeline ... risks raising prices as much as 20 cents a gallon in the Midwest, Great Plains and Rocky Mountains.*

At the same time, there may be a decrease in gasoline prices in the Gulf region because of the increase in oil supply there.

Time magazine's analysis concurred that Keystone would have almost no impact on gasoline prices:

> *Keystone would have little immediate [price] effect, especially since there's already sufficient pipeline infrastructure in place for the next few years.*

Additionally, there are indications that a portion of the oil sands piped through Keystone XL to Gulf Coast refineries will be made into products for export rather than kept here for American drivers. At a December 2, 2011, hearing before a subcommittee, Rep. Markey asked the CEO of pipeline-owner TransCanada whether he would agree to keep all refined products from oil sands in the United States. He declined.

One way to ensure that Keystone adds a marginal amount of oil to U.S. supplies is to require that the oil and its refined products be sold here—and not exported. On February 15 Rep. Markey offered an amendment to H.R. 3408 to "ensure that if the Keystone XL pipeline is built, the oil that it transports to the Gulf of Mexico and the fuels made from that oil remain in this country to benefit Americans." The amendment failed 173–254, which means that all or some of the oil sands can be exported.

Some advocates of building this pipeline claim that it would also help lower gasoline prices because this project is "shovel ready." This is also false. The Keystone pipeline isn't even *map* ready yet since its precise route through Nebraska has yet to be chosen. There has been no assessment of the potential harm to adjacent air, water, and land from its construction and operation once it is sited.

In fact, there is a growing controversy over building the pipeline in places where the route is *already* mapped. The *Los Angeles Times* reported on the conflict between landowners and TransCanada:

> *Canadian company that wants to build the 1,660-mile structure [is] going to court to force the cooperation of landowners who don't want it crossing their land.*
>
> *The issue has brought conservative tea party groups out rallying alongside environmentalists opposed to tar sands oil production, united behind [Julia Trigg] Crawford's attempt to keep the pipeline from crossing her 600-acre farm in the town of Direct, near Paris, where she fears it could contaminate the creek that irrigates her fields.*

The *New York Times* reports that TransCanada has begun condemning land to build the southern leg of the pipeline.

The bottom line is that the State Department and other independent analyses determined that the Keystone XL pipeline won't increase U.S. oil supplies, reduce gasoline prices, or even transport any oil anytime soon.

8. What does your analysis show to be the likely root of what are apparently artificially high prices?

Domestic oil production is high, and demand is low. Yet oil and gasoline prices are high. We know that oil markets don't follow normal supply-and-demand rules partly because there are few substitutes for oil, and also because its price is set by the OPEC cartel. We also know that there are other factors that contribute to oil prices in a world market such as concerns about potential supply disruptions due to natural disasters or political turmoil in the Persian Gulf. But even when we take all the normal factors into account, it doesn't add up.

Worldwide trends don't offer much of a clue, either. The Energy Information Administration reports that worldwide consumption in the first quarter of 2012 is essentially unchanged from the fourth quarter of 2011, though it is about 1 percent higher than a year ago. Yet the April 10 price of West Texas Intermediate crude oil—sold in the United States—was $101 per barrel. Brent oil on the European market was $120 per barrel—or 5 percent higher than last year.

There have been some relatively minor supply disruptions in Syria, South Sudan, and Yemen, according to a February 2012 report by the Energy Information Administration. Libyan production is also at 81 percent of its pre-civil war capacity. And Saudi Arabia—the world's

largest oil producer—has raised its output by about 600,000 more barrels per day than in 2011. Despite great tensions with Iran over its nuclear weapons program, there has not yet been a supply disruption in the Persian Gulf.

Even though it produces nearly all of its own oil, Canada is seeing inexplicably high gasoline prices too. *The Edmonton Journal* on March 30 reported that,

> *Canadians are paying some of the highest prices they ever have for gasoline, even though the amount that fuel makers pay for the crude oil that goes into making it has been in decline for months. ... Data from Statistics Canada on Thursday showed the price processors pay for crude oil fell 2.4 per cent in February from January, but the cost of gasoline from refiners rose 3.9 per cent. It was third straight month crude oil prices have declined and second straight month gasoline prices have increased.*

How can this discrepancy be explained? Even some leading oil experts express bewilderment about high oil prices. *Reuters* just reported that oil specialists found that high oil prices are inconsistent with current levels of supply and demand:

> *"The reality today is that the market is well oversupplied. OPEC production has been rising consistently since September and will probably continue rising further," said Colin Smith, energy strategist at VTB Capital.*

Similarly, on April 2 *The Wall Street Journal* determined that,

> *"There is no shortage of crude oil in the global markets and current prices aren't justified by demand-supply fundamentals," Qatar's energy and industry minister said Monday, easing concerns over supply constraints.*
>
> *"Oil producers are committed to supplying. When you look at demand-supply, there is no evidence of a shortage of oil anywhere in the world," Mohammed Bin Saleh Al Sada told reporters. "When it comes to price ... there are so many elements—not necessarily part of fundamentals of supply and demand—but other factors."*

Many Americans believe Big Oil companies are responsible for these "other factors" and suspect these giant corporations have rigged gasoline prices in their favor. Certainly oil companies have an incentive to support high gasoline prices. A March 1, 2012, report by the Congressional Research Service determined that higher gasoline costs

> *Yield a windfall for crude oil producers because the rise in gasoline prices is driven primarily by higher crude oil prices.*

9. How would you characterize the President's performance in regards to oil and gas exploration and production in the U.S.?

Gasoline demand is the second-lowest since 1997, due to modern vehicle fuel economy standards adopted by President Barack Obama in 2009—the first increase in more than 20 years. Consumption fell 1.8% from 2010 to 2011. First quarter 2012 consumption is 3.5% lower than the same time last year. Oil use falling due higher gasoline prices, displacement by biofuels, better fuel economy, slow economy

By 2016 the average car will use one-third less gasoline per mile compared to cars in 2010. The second round of standards will double fuel economy to 54.5 miles per gallon in 2025 compared to 2010. This will reduce oil consumption by 2 million barrels per day. The typical owner of a 2025 model car will spend $8,000 less on gasoline compared to an owner of a 2010 vehicle.

10. How has production from Federal lands fared under the Obama Presidency, and why does it matter?

We are also producing more of our own oil. For the first time since President Clinton, the United States is producing a majority of the oil we rely on to power our vehicles and economy. We are less reliant on other nations for oil and send less of our treasure abroad. *The New York Times* reported in March that, "In 2011, the country imported just 45 percent of the liquid fuels it used, down from a record high of 60 percent in 2005."

The Energy Information Administration determined that in 2011 the United States generated 3.7 quadrillion Btus of energy from crude oil produced from federal lands and waters compared to 3.3 quadrillion Btus in 2008—a 12 percent increase in production. And 2011 production from federal areas was higher than it was from 2006 through 2008 during the George W. Bush administration. What's more, the oil rigs in federal waters met significantly more protective worker and environmental-safety standards than before the BP oil tragedy in 2010.

A March 20, 2012, Congressional Research Service report reiterated the increase in oil production on federal lands under President Obama:

> *On federal lands, there was also an increase in production from 2008-2009 and another increase in 2010 (258,000 b/d [barrels per day]), then a decline in 2011. Overall, oil production on federal lands is up slightly in 2011 when compared to 2007.*

Similarly, the Columbia Journalism Review on March 22 reported that,

> *The average productivity on federal land and waters during the four Bush years, 2003-2008, was 634 million barrels per year. During the three Obama years, 2009-2011, it was 676 million barrels.*

In other words, average annual oil production from federal lands and waters was 5 percent higher under President Obama than it was under President Bush.

The increase in oil production—due horizontal drilling and hydraulic fracking in places such as the Bakken Shale in North Dakota and Eagle Ford in Texas. These technologies were developed

with federal research dollars, and benefit our security and economy. Last December the Washington Post reported that

> *There's no denying the extraordinary economic return on taxpayer investments. Shale gas is likely to allow the United States to go from net gas importer to net gas exported over the next decade.*

Producing more and using less oil reduces foreign oil imports and our trade deficit, creates jobs, saves families money on gasoline bills, and boosts economic growth by spending more oil dollars at home.

More domestic production from these new shale oil plays will not lower oil prices because prices are set on the world market. As long as oil prices remain high, so will gasoline prices.

Appendix II

Additional Material for the Record

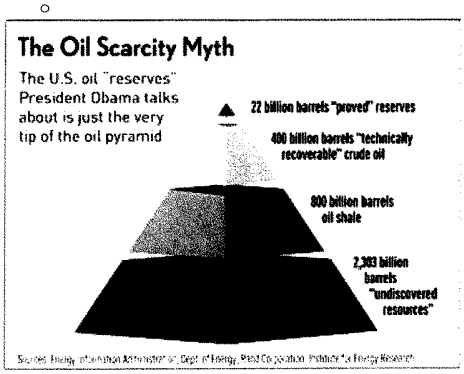
EXECUTIVE SUMMARY OF THE NATIONAL PETROLEUM COUNCIL REPORT SUBMITTED BY CHAIRMAN RALPH HALL

To view *PRUDENT DEVELOPMENT: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources, National Petroleum Council Report(2011)* visit *http://www.npc.org/reports/NARD-ExecSummVol.pdf*.

ARTICLE SUBMITTED BY CHAIRMAN RALPH HALL

Scarce Oil? U.S. Has 60 Times More Than Obama Claims

By JOHN MERLINE, INVESTOR'S BUSINESS DAILY Posted 01:03 PM ET



View Enlarged Image

When he was running for the Oval Office four years ago amid $4-a-gallon gasoline prices, then-Sen. Barack Obama dismissed the idea of expanded oil production as a way to relieve the pain at the pump.

"Even if you opened up every square inch of our land and our coasts to drilling," he said. "America still has only 3% of the world's oil reserves." Which meant, he said, that the U.S. couldn't affect global oil prices.

It's the same rhetoric President Obama is using now, as gas prices hit $4 again, except now he puts the figure at 2%.

"With only 2% of the world's oil reserves, we can't just drill our way to lower gas prices," he said. "Not when we consume 20% of the world's oil."

The claim makes it appear as though the U.S. is an oil-barren nation, perpetually dependent on foreign oil and high prices unless we can cut our own use and develop alternative energy sources like algae.

U.S. Awash In Oil

But the figure Obama uses — proved oil reserves — vastly undercounts how much oil the U.S. actually contains. In fact, far from being oil-poor, the country is awash in vast quantities — enough to meet all the country's oil needs for hundreds of years.

The U.S. has 22.3 billion barrels of proved reserves, a little less than 2% of the entire world's proved reserves, according to the Energy Information Administration. But as the EIA explains,

proved reserves "are a small subset of recoverable resources," because they only count oil that companies are currently drilling for in existing fields.

When you look at the whole picture, it turns out that there are vast supplies of oil in the U.S., according to various government reports. Among them:

At least 86 billion barrels of oil in the Outer Continental Shelf yet to be discovered, according to the government's Bureau of Ocean Energy Management.

About 24 billion barrels in shale deposits in the lower 48 states, according to EIA.

Up to 2 billion barrels of oil in shale deposits in Alaska's North Slope, says the U.S. Geological Survey.

Up to 12 billion barrels in ANWR, according to the USGS.

As much as 19 billion barrels in the Utah tar sands, according to the Bureau of Land Management.

Then, there's the massive Green River Formation in Wyoming, which according to the USGS contains a stunning 1.4 trillion barrels of oil shale — a type of oil released from sedimentary rock after it's heated.

A separate Rand Corp. study found that about 800 billion barrels of oil shale in Wyoming and neighboring states is "technically recoverable," which means it could be extracted using existing technology. That's more than triple the known reserves in Saudi Arabia.

All told, the U.S. has access to 400 billion barrels of crude that could be recovered using existing drilling technologies, according to a 2006 Energy Department report.

When you include oil shale, the U.S. has 1.4 trillion barrels of technically recoverable oil, according to the Institute for Energy Research, enough to meet all U.S. oil needs for about the next 200 years, without any imports.

And even this number could be low, since such estimates tend to go up over time.

Back in 1995, for example, the USGS figured there were 151 million barrels of oil in North Dakota's Bakken formation. In 2008, it upped that estimate to 3 billion barrels to 4.3 billion barrels — a 25-fold increase. Now, some oil analysts say there could be as much as 20 billion barrels there.

And USGS in 2002 quadrupled its oil estimate in Alaska's National Petroleum Reserve.

To be sure, energy companies couldn't profitably recover all this oil — even at today's prices — and what they could wouldn't make it to market for years. But from the industry's perspective, the real problem with domestic oil is that the government has roped off most of these supplies.

The Alaska National Interest Lands Conservation Act of 1980, for example, put a huge swatch of land off-limits to drilling. And in 1982, Congress blocked access to most of the oil in the Outer Continental Shelf. Much of the oil on federal lands is also off-limits.

Obama and others say the industry's claim about lack of access isn't true, since they aren't even using many of the offshore leases they already have. The industry counters that this is misleading, since a company needs the lease before it can determine if any oil exists there — a potentially time-consuming process.

In any case, any attempt to get at these vast new oil supplies is sure to face fierce opposition from environmental groups worried about oil production's direct impact on the environment, as well as global warming worries.

But given today's prices, most of the public is willing to expand drilling offshore, in ANWR, and in shale oil reserves, according to the latest IBD/TIPP poll.

"This is not a geological problem — it's a political problem," said Dan Kish, senior vice president for policy at the Institute for Energy Research. "We've embargoed our own supplies."

ARTICLE SUBMITTED BY CHAIRMAN RALPH HALL

New regs could create 'nightmare scenario' for industry -- Texas regulator

Nathanial Gronewold, E&E reporter

http://www.eenews.net/energywire/print/2012/04/16/4

Published: Monday, April 16, 2012

HOUSTON -- Texas' crude oil production could peak at 4 million barrels per day should the industry be freed from regulation and allowed to grow, about a fourfold expansion from where it stands today, the head of the state's oil and gas regulatory body declared last week.

Such a feat would see Texas alone becoming a major global oil powerhouse, eclipsed only by Saudi Arabia, Russia, Canada and the rest of the United States. But a "nightmare scenario" could see this optimistic picture reversed by 2020, the official warned.

Up for election this year for one of two openings on the three-member Texas Railroad Commission, current Chairman Barry Smitherman delivered a speech and took questions during an energy and environment forum, hosted by the *Texas Tribune*, at the University of Houston on Friday.

Smitherman gave some lofty predictions on where domestic oil supplies could be headed based on his reading of developments, but warned that the boom in oil drilling and production growth the United States is experiencing today could be upended by what he sees as onerous federal regulations and misguided environmental activism.

The greatest threat to Texas and U.S. energy potential, Smitherman said, is "regulations ... that kill the technology that's taking us to energy independence: hydraulic fracturing."

According to data from the commission and others, Texas is producing around 1.1 million barrels per day, up by roughly 200,000 barrels a day from 2011. The United States is thought to be pumping 6 million barrels a day of crude oil domestically.

Conservative estimates anticipate Texas doubling its production to more than 2 million barrels a day by around the next decade, returning to levels not seen since the early 1980s. But the TRC chairman indicated last week that a better estimate sees an output potential of almost quadruple what the state pulls from the ground today -- up to 4 million barrels per day in crude oil production thanks to enhanced extraction techniques.

Smitherman said his estimate comes from just looking at the state's two largest crude oil plays -- the Permian Basin and the Eagle Ford Shale.

In his speech, Smitherman noted that the Permian is already producing most of the state's crude oil: 700,000 barrels a day thanks to a combination of conventional production, enhanced oil recovery using carbon dioxide and other methods, and increasingly via hydraulic fracturing and horizontal drilling. Texas regulators and industry see this figure rising to 2 million barrels a day just from that field in the coming years, Smitherman said.

Those comments largely echoed what other Permian Basin drillers were saying at a recent industry conference in Midland, Texas. Constraints on infrastructure needed to move the crude to market could

slow developments down, but by and large oil and gas producers are reporting strong results from using new oil extraction methods in the Permian Basin.

Smitherman complained that efforts to get new resources out of the Permian threaten to be delayed or derailed entirely because of environmental litigation aiming to add a species of lizard common in the region to the Endangered Species Act.

For the Eagle Ford Shale, he offered figures that are much more bullish than some previous estimates of where production at that field could be headed.

At around 300,000 barrels per day of crude output and rising quickly, the Eagle Ford is still considered a smaller play than North Dakota's Bakken Shale, where production now exceeds 500,000 barrels per day.

Nevertheless, Smitherman said, it's entirely probable that Eagle Ford output could grow to match the Permian Basin's expected figures, adding another 2 million barrels per day to Texas crude production. Adding his estimates of the Eagle Ford and Permian Basin together gives Smitherman his 4-million-barrel-per-day target in Texas oil production.

Embracing hydraulic fracturing will "make the U.S. more significant ... than Iran, China, Iraq or Venezuela," Smitherman said.

During a discussion narrowing in on developments in the Eagle Ford, state Sen. Carlos Uresti (D), whose San Antonio district is in the shale play, acknowledged that developments there are moving faster than many communities can handle.

Uresti said he estimates oil and gas project spending in the Eagle Ford rose from $1.8 billion in 2007 to $14.6 billion last year. The resulting stresses on infrastructure and pressures felt by rural communities in the region are not being addressed by an interim state senate committee "to try to come up with core ideas on how to deal with the infrastructure problems," he said.